THIRD SERIES VOL 65 NUMBER 12 OCTOBER 1958

THE JOURNAL OF THE ROYAL INSTITUTE OF BRITISH ARCHITECTS

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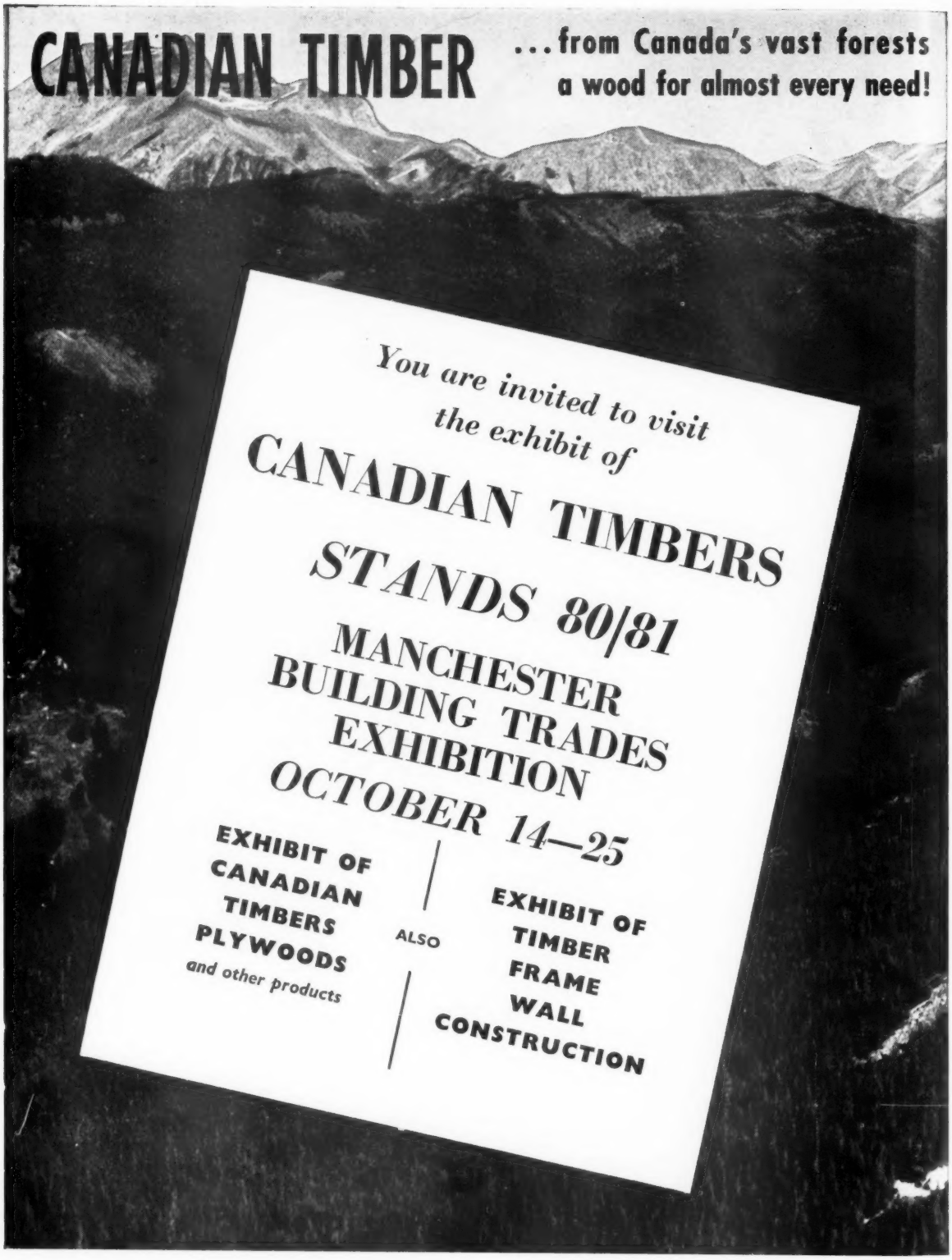
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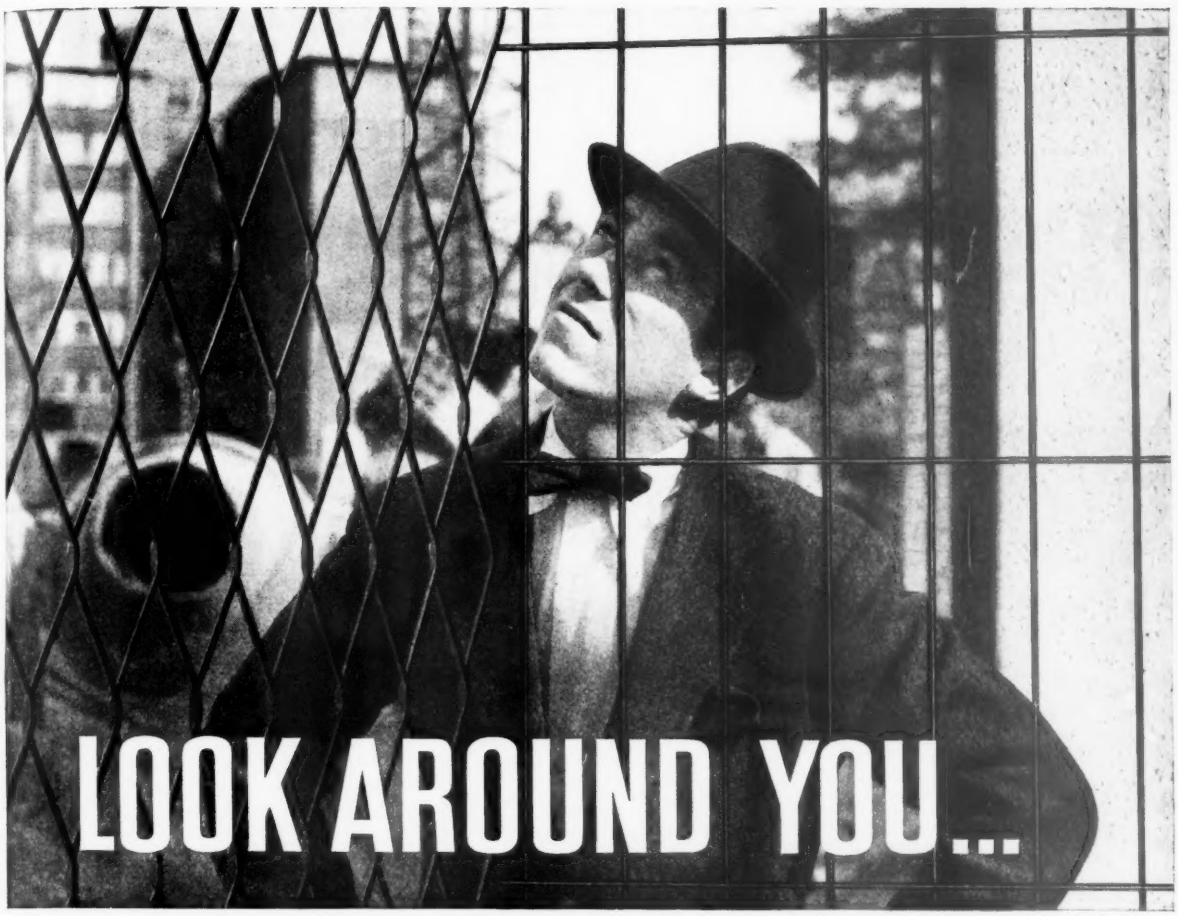

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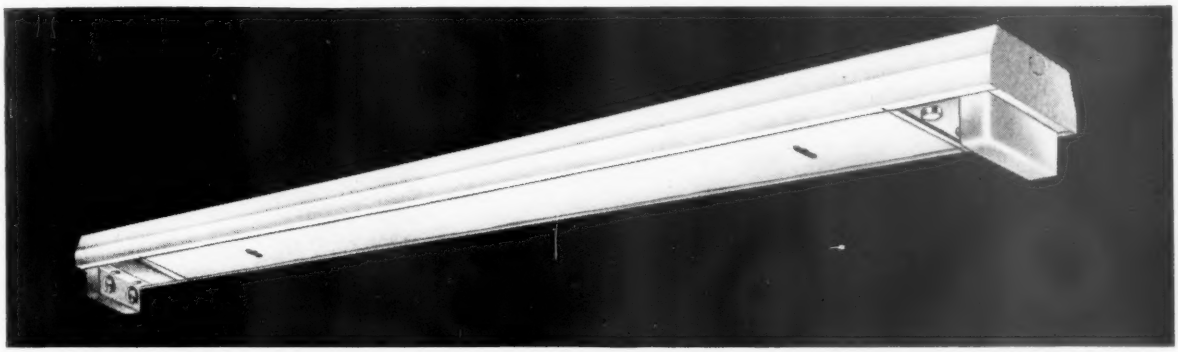

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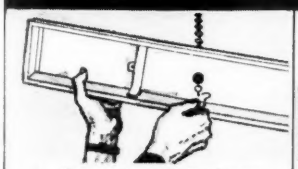
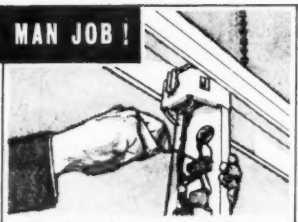
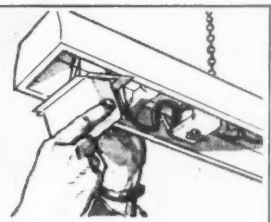


1 *Empty spine easily fixed to conduit, chain, universal suspension or ceiling. The 5ft. spine weighs only 7 lbs.*



2 *Control gear tray hooked at one end into spine, hangs vertically leaving both hands free to make connections. Tray swung into final position and firmly fixed with captive wing nut.*



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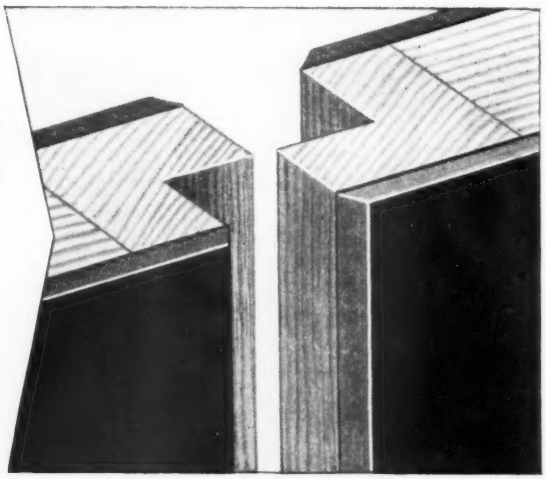

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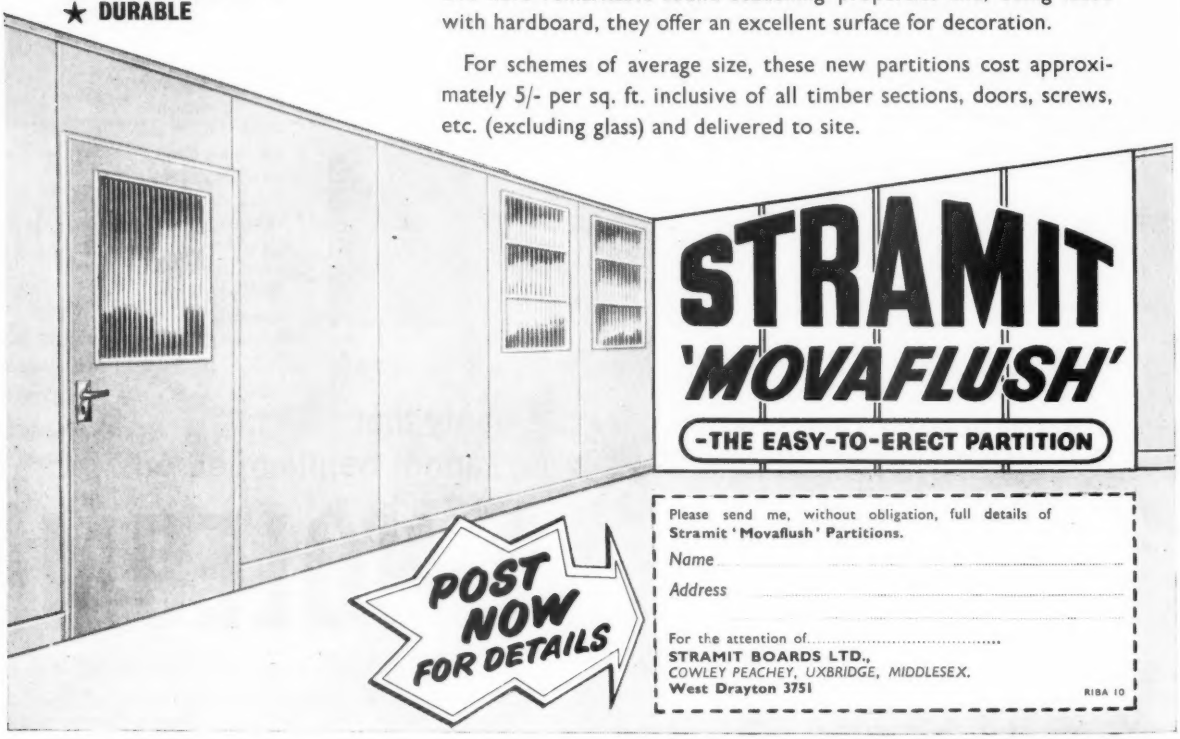

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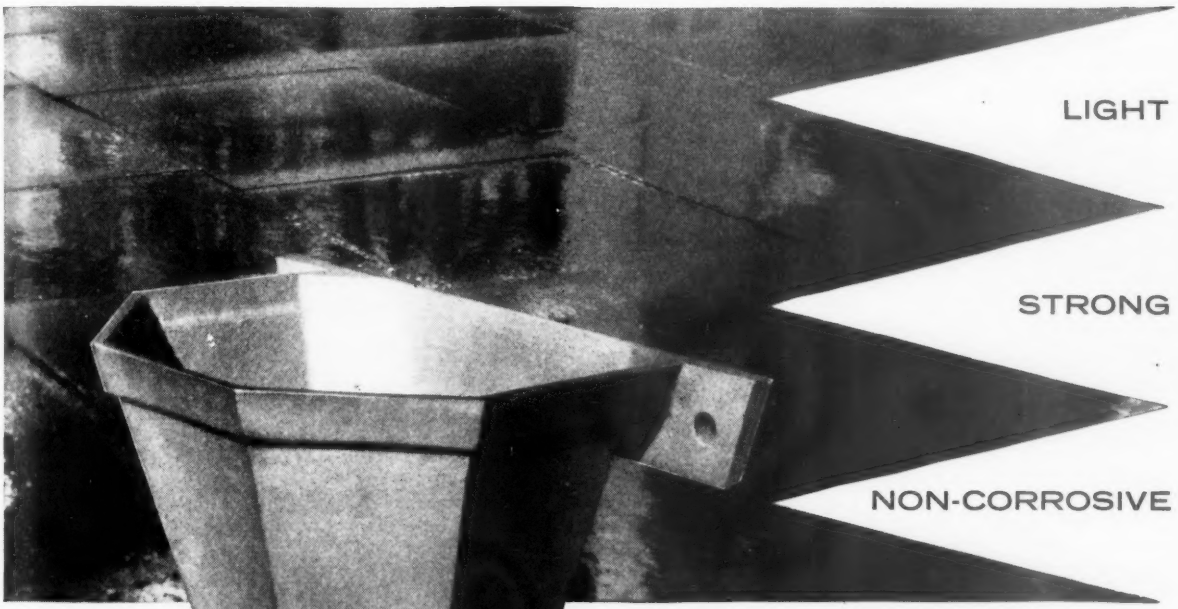

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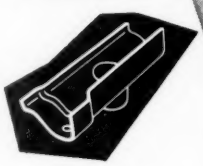

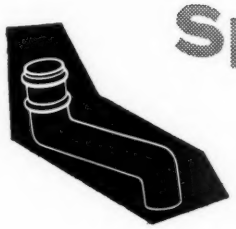

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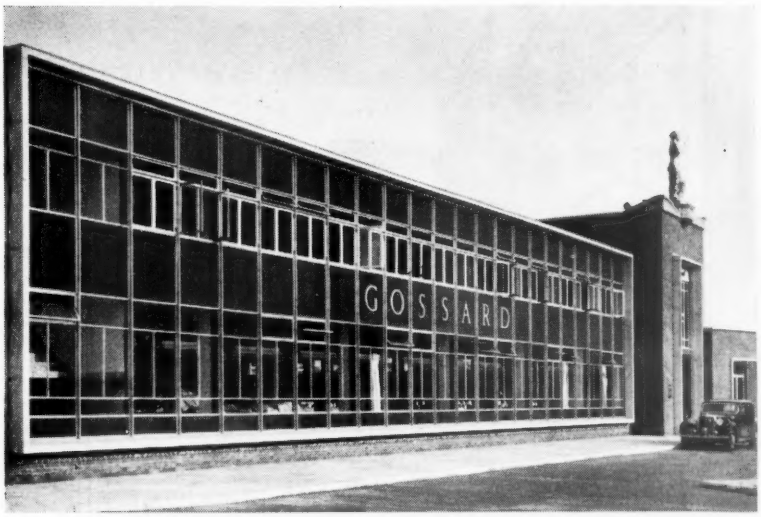

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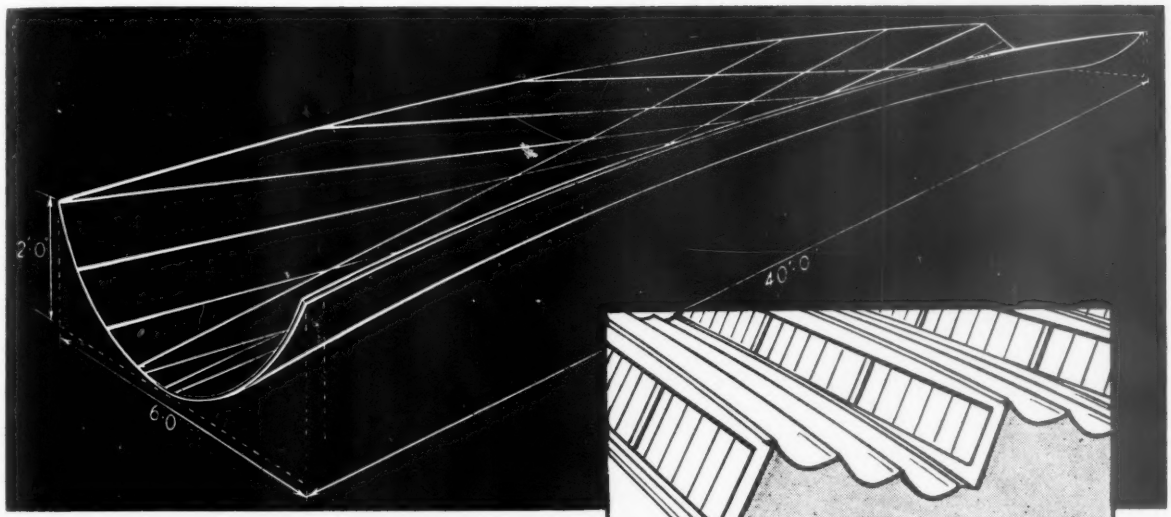
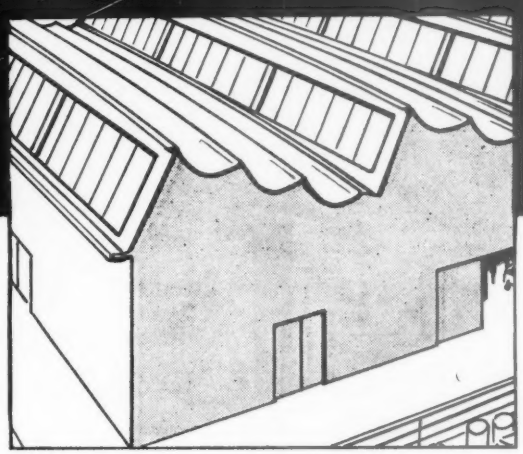


'Hyperboloid of Revolution' with graphic construction and lines giving definition of surface.



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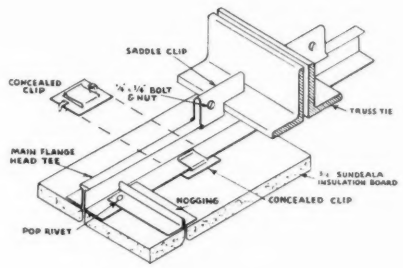

The Central Finger of the Gatwick Airport Terminal Building has **suspended** fibreboard ceiling throughout, by the Sundeala Board Co. Ltd., the panels being v-jointed and secured to Sundeala Metal Fixings.

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Consulting Engineers: Messrs. Fredk. S. Snow & Partners,
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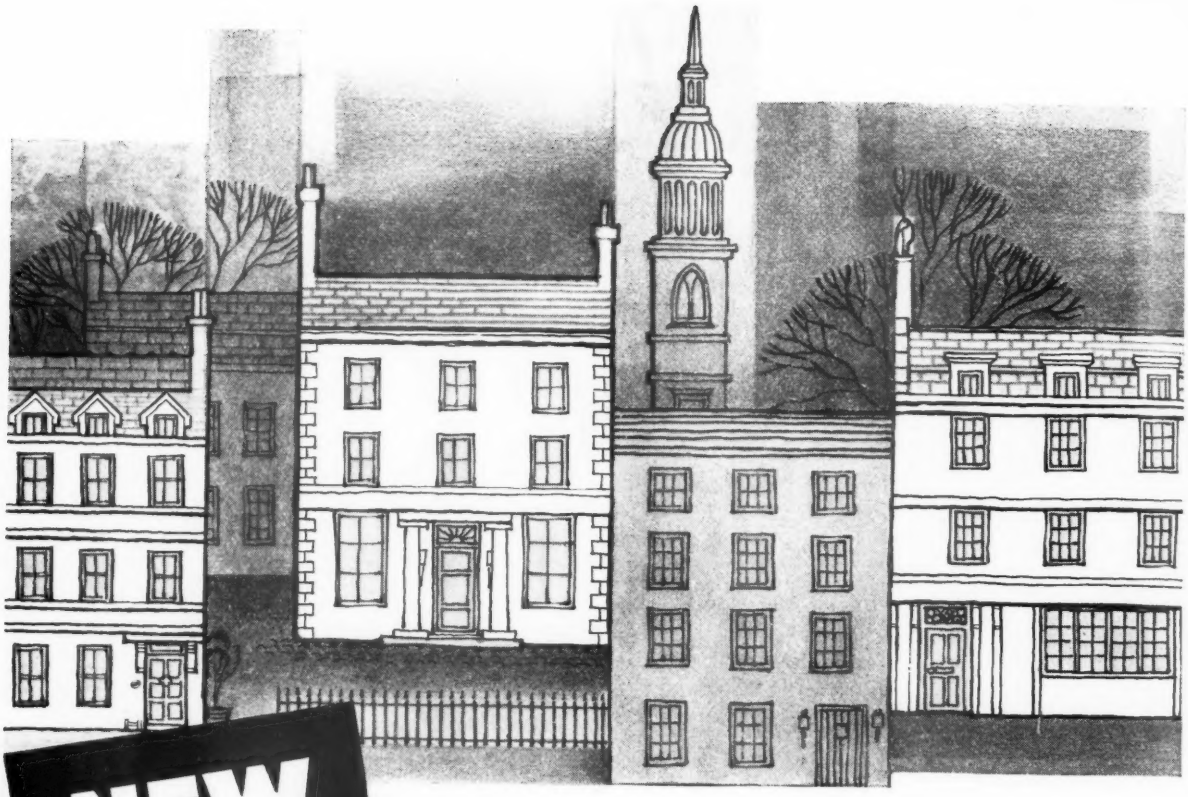

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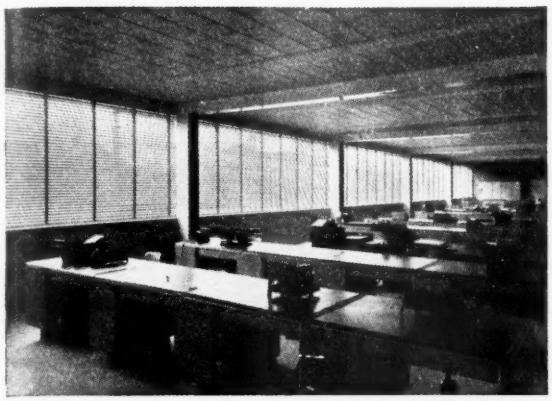

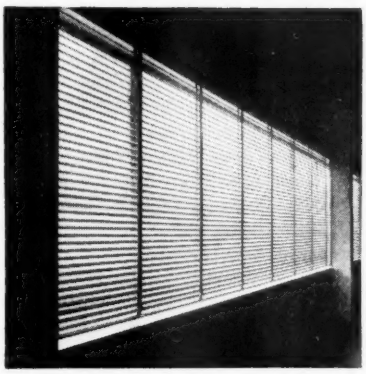

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TBW/91

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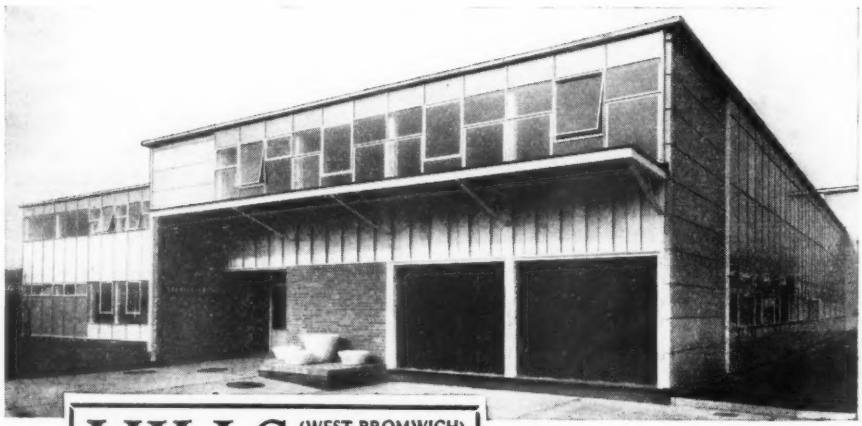
Consulting Engineers: Campbell, Gifford & Morton Limited.

Right: Sterile Products Building, Ware, for Allen & Hanburys Limited.
Architects: Peter Dunham, Widdup & Harrison.



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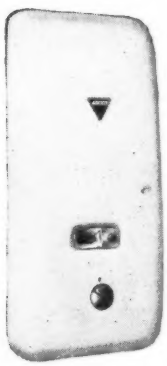
Expressed in a modern idiom, these new offices are in keeping with the world-wide prestige of I.C.I. The accommodation includes directors' rooms, boardroom, an electronic computor room, and three administration wings with a central service area. The Concrete Development Co. Ltd. undertook the structural work which is largely of pre-cast pre-stressed concrete. Facing bricks of three different colours combine with mosaic columns and continuous windows to provide a pleasing elevation.

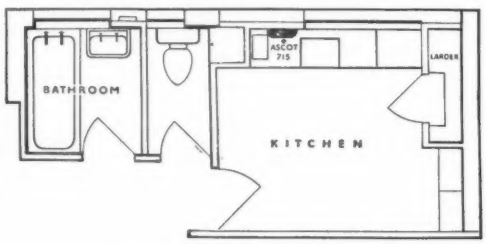
Tower Court Flats, Clapton Common

ASCOT IN NEW HOUSING (7)



Tower Court Flats, Hackney, is one of a number of schemes designed by different architects around the perimeter of Clapton Common for the Hackney Borough Council. Tower Court consists of 2 blocks of flats: a four-storey block containing 16 two and three-bedroom maisonettes, and a nine-storey block containing 51 flats of bed-sitting room, one-bedroom and two-bedroom design.

To provide an instantaneous hot water service throughout all the flats at Tower Court, Ascot 'balanced flue' multipoints were installed in the kitchens.



PLAN OF KITCHEN AND BATHROOM IN A TYPICAL TOWER COURT FLAT SHOWING POSITION OF ASCOT 715

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Architect: Harry Moncrieff, F.R.I.B.A., A.M.T.P.I. of Co-operative Planning Ltd.

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OCTOBER 1958 THIRD SERIES VOL. 65 NUMBER 12 THREE SHILLINGS AND SIXPENCE

EDITORIAL

C. H. Aslin

It has been announced that Mr. C. H. Aslin, C.B.E., Past-President, is retiring in December from the post of County Architect of Hertfordshire which he has held since 1945.

Under his leadership the post-war programme in Herts set the course which gave fresh momentum to the design and construction of school buildings.

With the possible exception of the New Towns, no other phase of British architecture since the war has attracted such favourable notice from abroad. It has been a great achievement.

Mr. Aslin's success must be partly due to his modesty. He once said to a younger member of his staff that he would never have been a county architect if it were not that so many of his fellow students, who were better architects than he, had been killed in the First War. Perhaps it was this that led him so positively to delegate responsibility. He himself provided shelter for the work of many young architects who were made responsible and given freedom to design and supervise buildings, frequently at an age when in any other office they would have been little more than hack draughtsmen. The Herts office has provided, under Mr. Aslin, a further education of the most successful kind, a practice where architects matured quickly. How successful can be measured by the number of county and deputy county architects, senior partners in flourishing firms and architects in official positions who at one time worked at Herts.

R.I.B.A. Conditions of Engagement and Scale of Professional Charges

The Royal Institution of Chartered Surveyors have recently introduced a revised Scale of Professional Charges which came into effect on 1 August 1958. Since Clauses B.11–16 of the R.I.B.A. Scale are in accordance with the R.I.C.S. Scale, having been adopted by the R.I.B.A., consequential amendments have been made to the R.I.B.A. Scale, which will take effect as from 1 October 1958. Reprints of the R.I.B.A. Scale of Professional Charges will embody these amendments in the text; in the meanwhile amendment slips are available from the R.I.B.A. which may be used by members to bring existing copies of the Scale up to date.

Progress in Planning Hospitals

At the Science lecture on 21 October being given jointly by Mr. R. Llewelyn Davies [*F*], Director of the Nuffield Foundation Division for Architectural Studies and Mr. John Weeks [*A*], Mr. Llewelyn Davies will speak on recent development in hospital design in this country. His talk will be concentrated on certain new concepts in hospital planning, which have emerged since the last conference held at the R.I.B.A. in 1954. His talk will be illustrated with slides of recent and projected hospital work.

Mr. Weeks will speak on post-war hospital development in the United States of America. A great deal of hospital work has been standardised to conform with plans approved by the United States Public Health Administration in order to qualify for a grant under the Hill Burton Act of 1946. There have been notable exceptions to this, however, some of which are exemplified in the chain of hospitals built in Kentucky, Virginia and West Virginia by the United Mine Workers of America Welfare Fund. This talk will be illustrated.

The Ex-Regular and the Professions

For the next four years some 1,500 regular officers are due to retire prematurely and many of them will be looking round for civilian employment. It may well be that some of them will be attracted to the profession of architecture. In a short article sent out to professional journals, Air Chief Marshal Sir Ronald Ivelaw-Chapman, Director of Resettlement to the Regular Forces Resettlement Service of the Ministry of Labour and National Service, appeals to members of the professions to do everything they can to assist these ex-regulars to find their feet in their new circumstances (see p. 429).

Those members who are approached for advice or who are in the position to give assistance will, we know, respond to Sir Ronald's appeal.

Addition to Birthday Honours List

M.B.E. H. W. Langham-Hobart [*Student*].

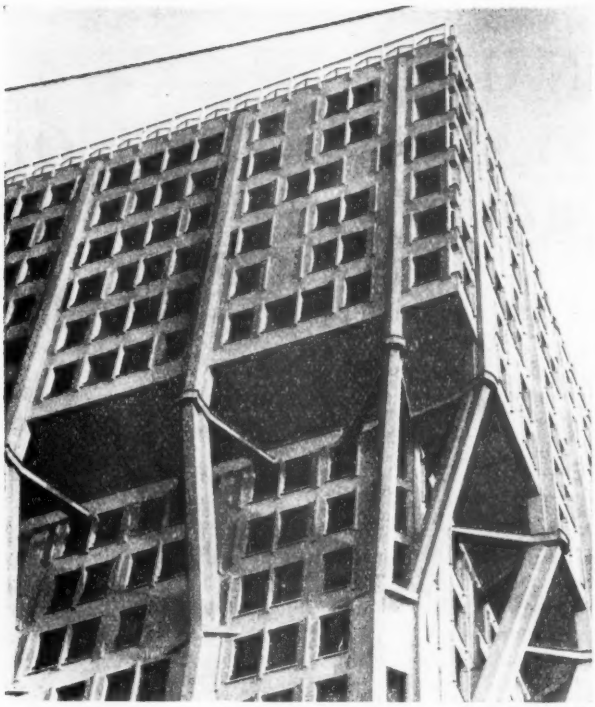


photo: Studio BBPR

Torre Velasca, Milan, detail. Architects: Belgioioso, Peressuti & Rogers (see pp. 408–414)

The Annual Discourse

When Mr. R. Buckminster Fuller delivered the Annual Discourse on 5 June he spoke without notes but his address was recorded on tape. The report in this month's JOURNAL has been transcribed from this recording and is the version authorised by Mr. Buckminster Fuller for publication.

The illustrations are his own selection from among the seventy-odd he showed after the Discourse.

'A' Series of paper sizes

Many inquiries have been received at the R.I.B.A. by architects wishing to adopt these sizes for their office papers or who wish to know what publications are already being produced to 'A' sizes. The technical section of the Institute is now using 'A' size paper and all the accessories which go with it, and should you have any queries Mr. Anthony Williams would be very pleased to help you in any way he can.

A.B.S. Ball 1958—'Old China'

A previous announcement concerning the A.B.S. Ball, which is to be held at Grosvenor House on 10 December, stated that tickets would cost £2 12*s*. The price of the tickets should, however, have been given as £2 12*s*. 6*d*. each. A ticket application form is enclosed.

R.I.B.A. Diary

TUESDAY 4 NOVEMBER. 6 p.m. General Meeting. President's Inaugural Address. Presentation of the London Architecture Bronze Medal. Unveiling of the portrait of Mr. Kenneth M. B. Cross, M.A., D.C.L., Past President. Presentation of R.I.B.A. Awards for Distinction in Town Planning.

Cost Control Conference

As announced earlier, a week-end conference on methods of cost control, arranged by the Cost Research Committee of the Institute, is to be held at Missenden Abbey, Great Missenden, Bucks, from the evening of Thursday 15 to Sunday 18 January 1959.

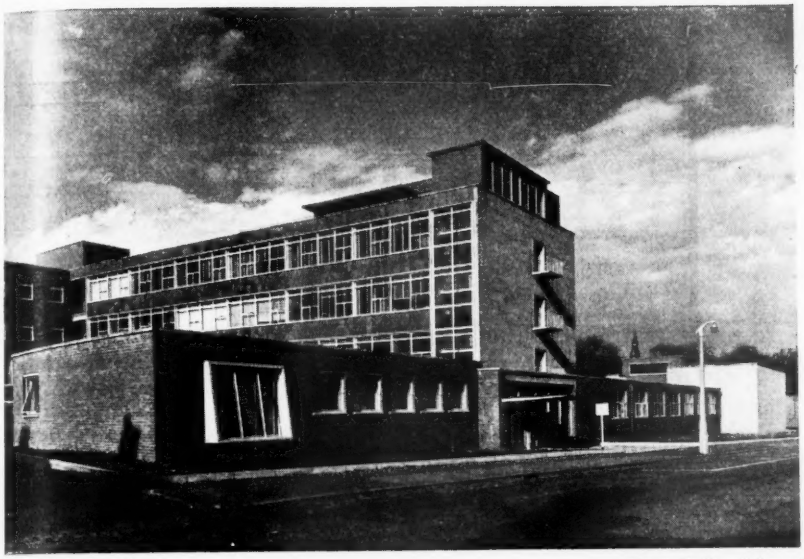
The speakers at the conference and their subjects will be as follows: *Thursday* 15 *January:* 1. 'The architectural profession in relation to the national economy and world conditions', by Professor J. V. Connolly, B.E., F.R.Ae.S., M.I.Prod.E. (Director of Sundridge Park Management Centre). *Friday* 16 *January:* 2. 'Techniques and methods of cost control': (i) 'The architect's role', by Mr. S. A. W. Johnson-Marshall [*A*] (Robert Matthew and Johnson-Marshall), and (ii) 'The quantity surveyor's role', by Mr. J. Nisbet, A.R.I.C.S. (Principal Quantity Surveyor, Ministry of Education). 3. 'Cost planning. Detailed approach and alternative working-out of techniques': (i) by Mr. Clifford Nott, A.R.I.C.S., and Mr. R. J. Whitley [*A*] (Hertfordshire County Council), and (ii) by two further speakers to be arranged by the R.I.C.S. *Saturday* 17 *January:* 4. 'Cost analysis and its application to cost planning and cost control techniques', by Mr. Cyril Sweett, F.R.I.C.S. (Chairman, R.I.C.S. Cost Research Panel). 5. 'Research, cost planning and cost control', by Mr. W. J. Reiners, B.Sc. (Building Research Station). 6. 'The architect's responsibility for programming and contract planning', by Mr. A. W. Cleeve Barr [*A*] (Ministry of Education). 7. 'The importance of communications in cost control', by Mr. A. C. Leyton, B.A., Ll.B. (Organiser of Liberal Studies, Northampton College of Advanced Technology). *Sunday* 19 *January:* 8. 'The effect of the design process at the tender stage and before operations commence', by Mr. E. J. Cook, B.Sc., A.M.I.C.E. (Messrs. Richard Costain, Ltd.).

The programme is so arranged as to allow ample time for discussion both on a group basis and in open forum.

The following Allied Societies have been invited to send representatives: Berks, Bucks and Oxon Architectural Association, Hampshire and Isle of Wight Architectural Association, South Eastern Society of Architects, Norfolk and Norwich Association of Architects, Suffolk Association of Architects, and the Essex, Cambridge and Hertfordshire Society of Architects. In addition residential places are open to individuals and additional places will be available for non-residents.

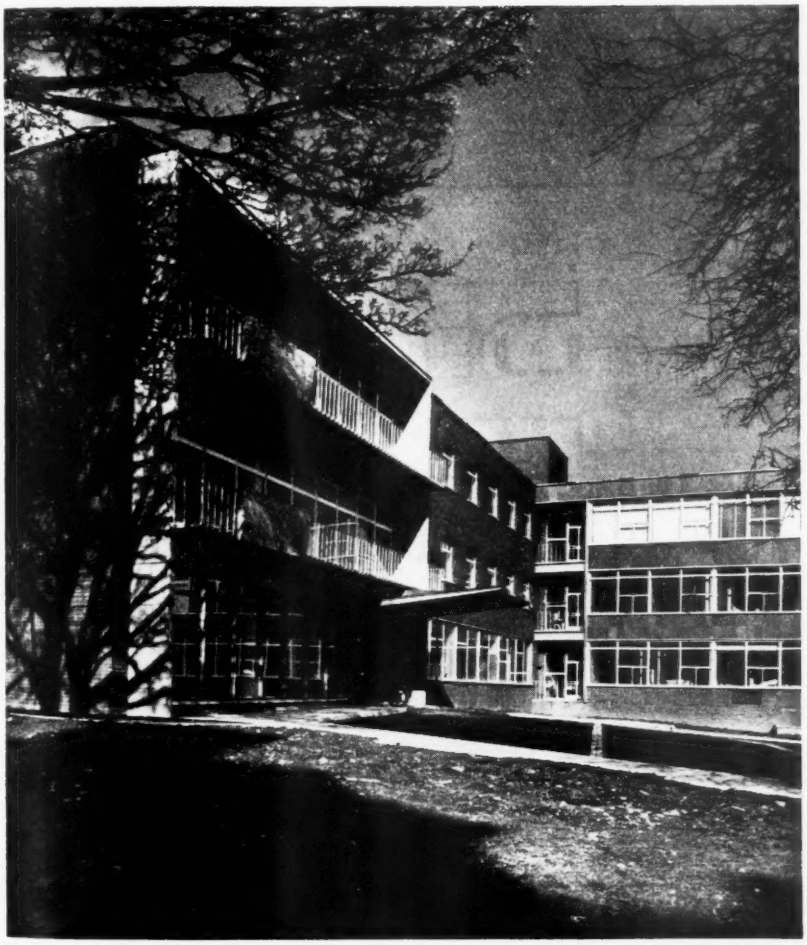
The charge for the week-end will be £10 to cover meals and accommodation at Missenden Abbey and the set of conference papers. This sum also covers the cost of organising the conference so that it will be self-supporting. The charge for non-residents, to include meals other than breakfast, will be £7.

Applicants are asked to write to the Secretary of the Cost Research Committee at the R.I.B.A., 66 Portland Place, London, W.1, giving details of their age, professional or other qualifications, where they work and in what capacity, and what experience, if any, they have had in the application of cost control methods, and saying whether they will require a residential or non-residential place. Applications should be sent in not later than 1 November 1958.



View from south

photo: Architects' Journal



View from west

photo: Architects' Journal

Radio Therapeutic Institute at the Western General Hospital, Edinburgh

Architect: John Holt [*F*]

THIS BUILDING was awarded the R.I.B.A. Architecture Bronze Medal for the seven-year period ending 31 December 1956 in the area of the Royal Incorporation of Architects in Scotland.

The Western General Hospital, Edinburgh, is the centre of a large-scale hospital development. A plan has been evolved to replace and improve hospital facilities over a number of years as finance becomes available, so that ultimately a new general hospital is created with the minimum of interference to the service.

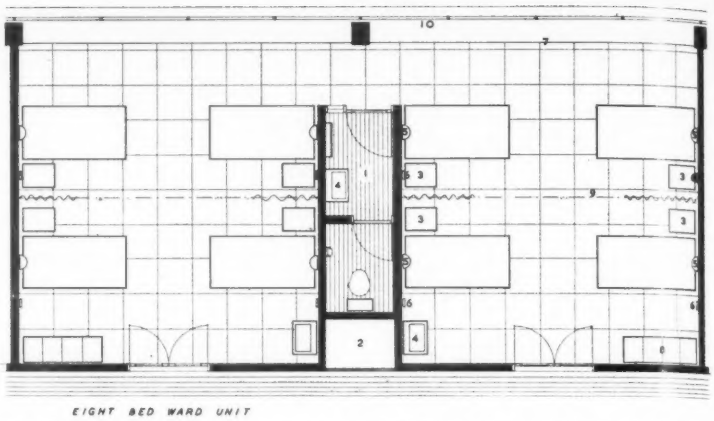
The Radiotherapeutic Institute lies to the east of the existing Western General Hospital, on an L-shaped site, bounded on the south and east by access roads and on the west by a row of large forest trees which act as a natural setting to the building. A height restriction to the south and an arbitrary building line were imposed by the superiors of a block of flats situated at the north-east corner of the site. These factors and the 16 ft. slope from north to south influenced the plan considerably.

The Cancer Hospital accommodates 110 beds, a range of X-ray diagnostic and therapeutic equipment, a follow-up out-patients department, operating theatre suite for radium application, a group of research laboratories, and dining areas for staff and patients. It was a condition of planning that the building would be adjacent and linked to the existing hospital and easily accessible to the large number of out-patients approaching by the main road. The high voltage equipment was manufactured under a Ministry of Health programme and included the 4-million volt linear accelerator. In addition a 2-million volt Van-de-Graff machine produced in America was installed. All sections of the high voltage treatment suite were artificially ventilated at 10 air changes per hour, and the colour schemes in this area were selected with great care. The direct viewing of patients under treatment by high voltage machines was achieved by the use of 24 sheets of plate glass separated by paraffin. On the installation of the Van-de-Graff this method was improved by the use of 10 sheets of 1½ in. clear white plate unstabilised.

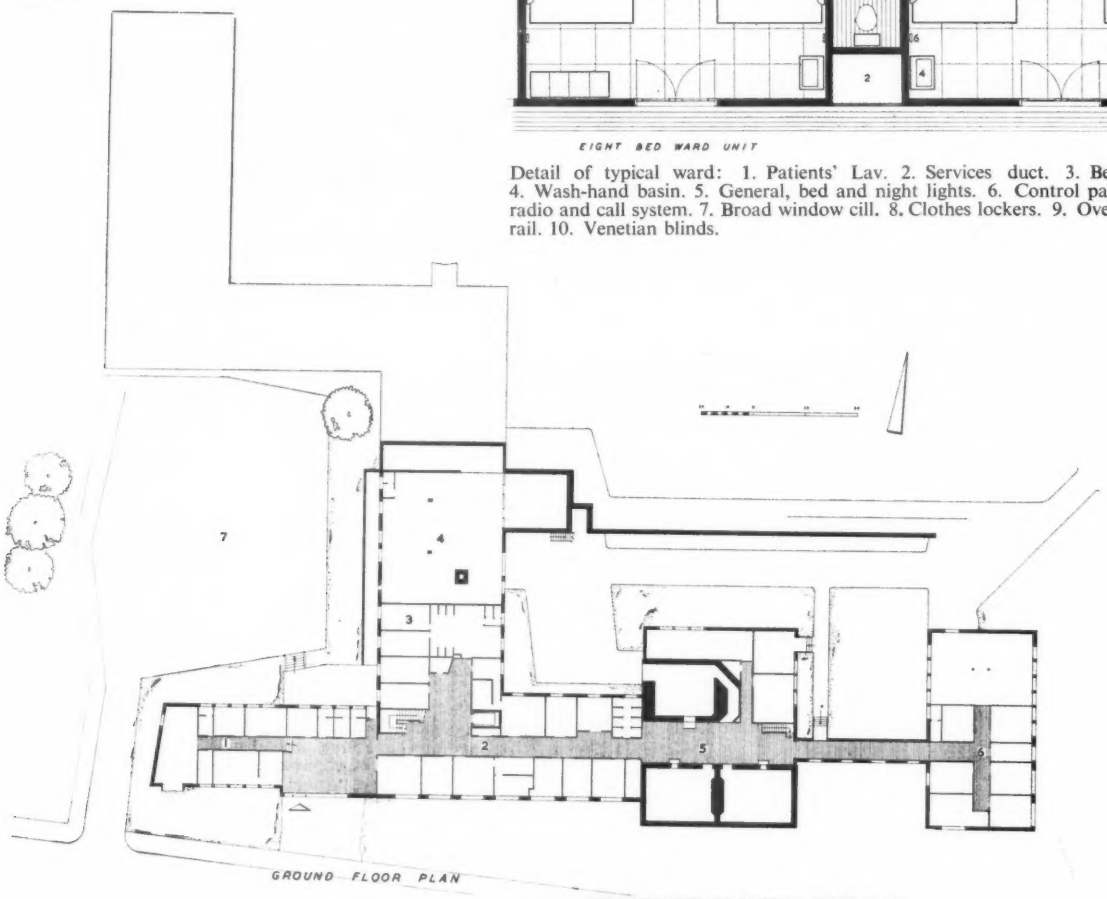
The waiting areas for patients are sited as near to treatment areas as possible to improve efficiency. In the 10 low voltage treatment rooms lead was inserted in the floor and lead plymax used on the walls. By reason of excessive cost in the high voltage rooms, mass concrete up to 5 ft. 4 in. thick formed the protection. In the Nursing Unit one ward kitchen serves 49 beds and is sited adjacent to the goods lift. Two bed lifts, one passenger and one goods lift serves the building. The whole unit is designed to observe maximum flexibility so that the beds in groups can be used for male or female patients on any one floor.

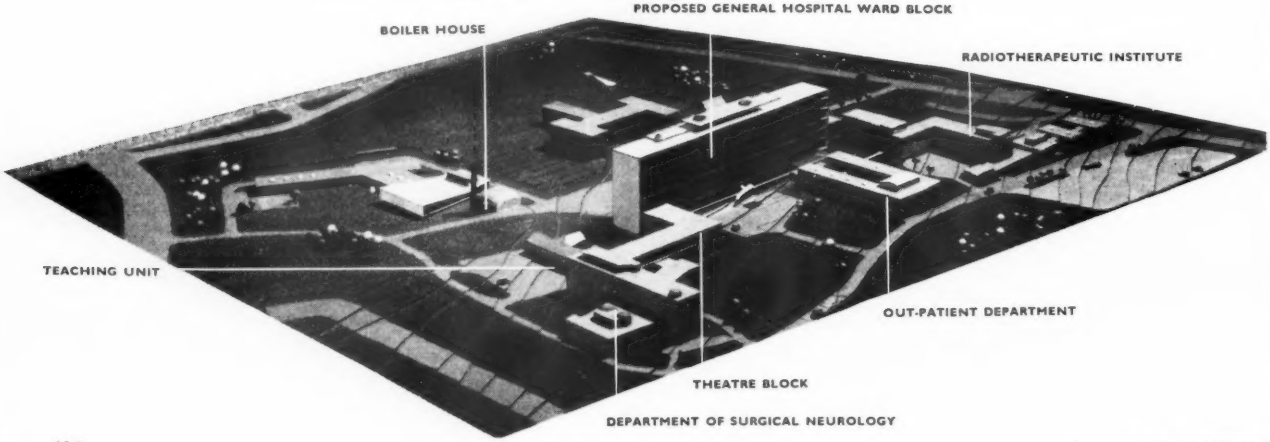
The north wing of the building contains the Department of Bio-Chemistry Research, radium operating theatre, radio-active working areas and staff dining rooms at roof level. These latter rooms enjoy magnificent views overlooking the centre of Edinburgh.

The building is reinforced concrete framed with hollow tile floors and vermiculite screeds to roofs covered with felt. The materials used in construction were selected with care and will retain their qualities over the years. Gables were faced with Blaxter stone and the panel infill between windows was Broughton Moor green slate. In selected areas mahogany vertical boarding added a richness whilst a plum coloured brick was selected in sympathy with surrounding buildings. It is to be regretted that no finance was available for sculpture, although this was included in the original conception.



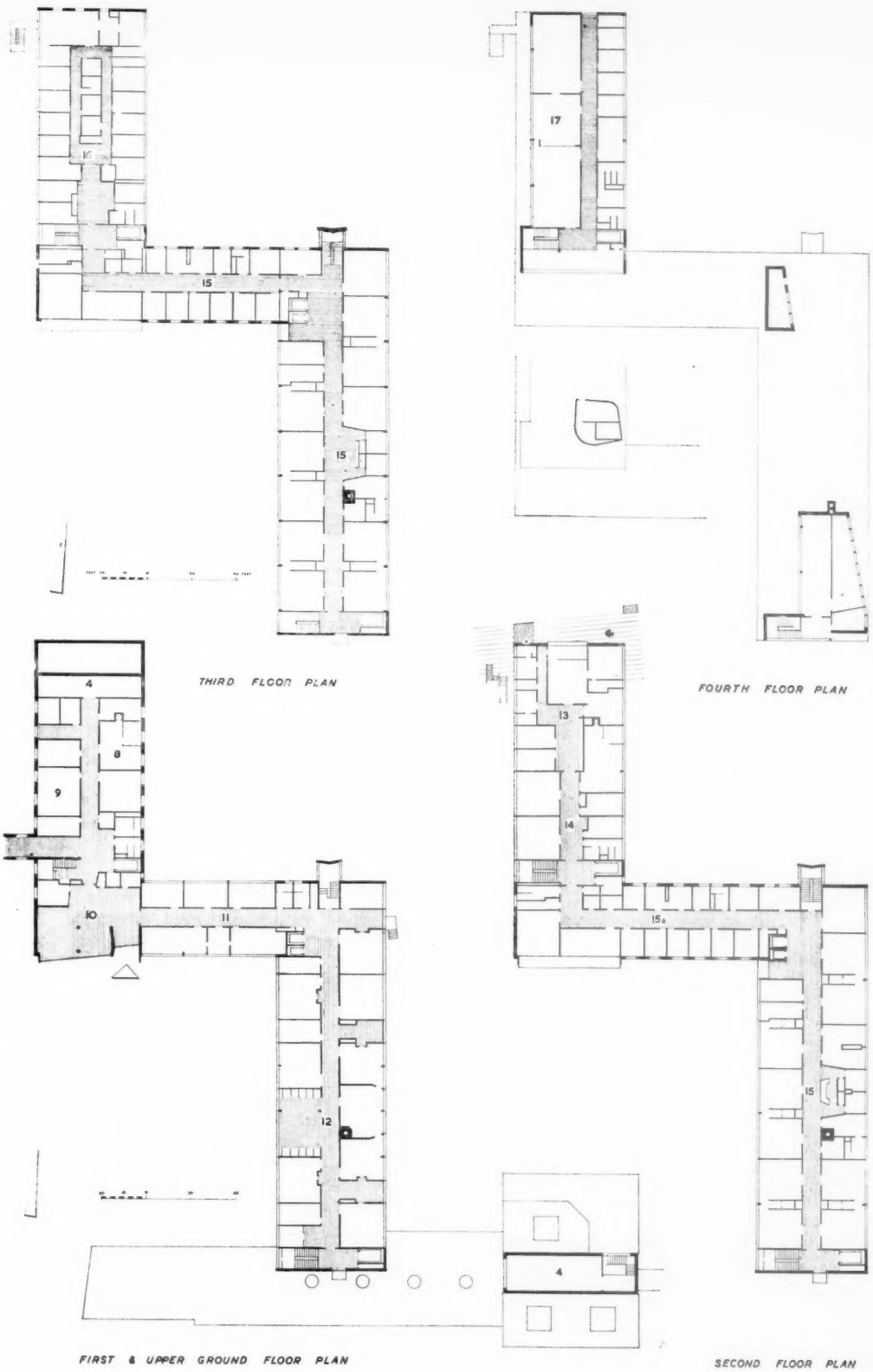
Detail of typical ward: 1. Patients' Lav. 2. Services duct. 3. Bedside locker. 4. Wash-hand basin. 5. General, bed and night lights. 6. Control panel for lights, radio and call system. 7. Broad window cill. 8. Clothes lockers. 9. Overhead curtain rail. 10. Venetian blinds.



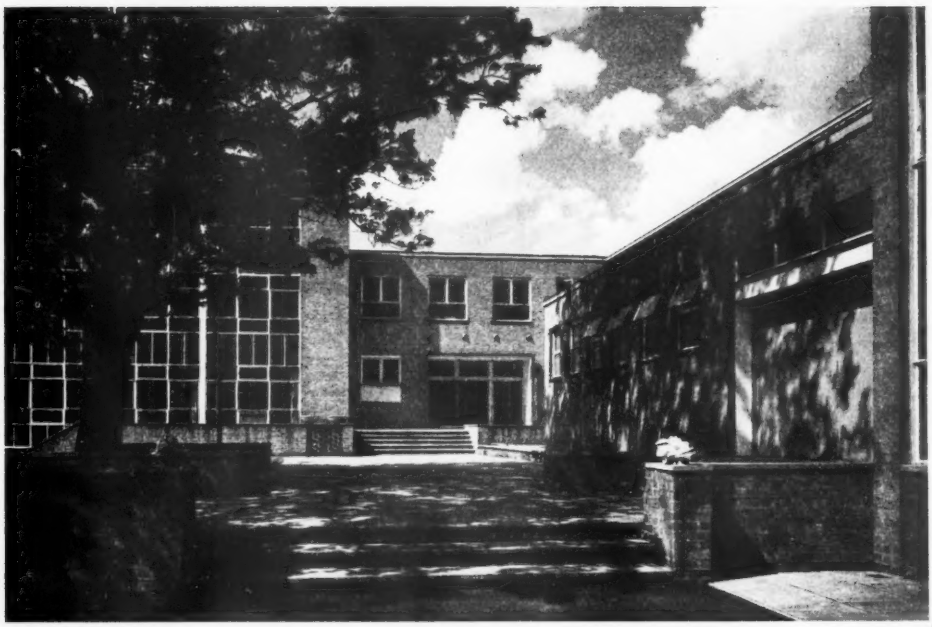


KEY

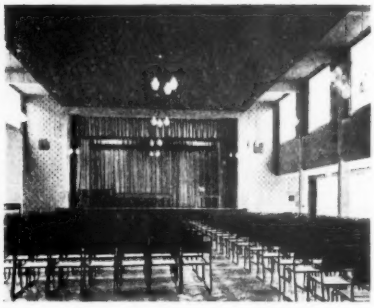
1. Medical staff rooms.
2. Out-patient clinic.
3. Investigation.
4. Heating and ventilation plant.
5. High voltage X-ray treatment.
6. Physics laboratories and workshop.
7. Car park.
8. Radium preparation.
9. Library.
10. Patient reception and visitors' entrance.
11. In-patients' dining accommodation and staff.
12. Low voltage X-ray treatment.
13. Operating theatre suite.
14. Post-operative ward unit.
15. Ward unit.
16. Research laboratories.
17. Kitchen and dining accommodation.



On facing page: model of development



The Main Entrance



New Heys Grammar School for Girls

Allerton, Liverpool

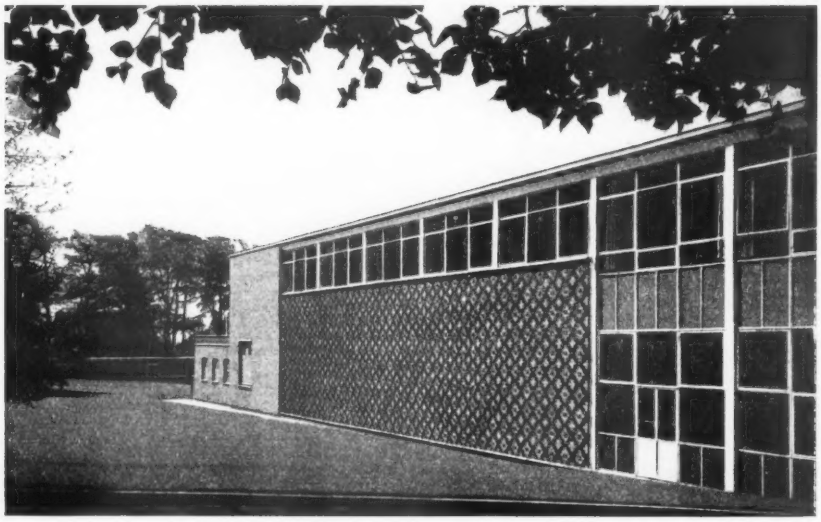
Architects:

Messrs. Herbert Thearle [*F*/*A*]

in collaboration with

Ronald Bradbury, Ph.D. [*F*]

City Architect and Housing Director
Liverpool

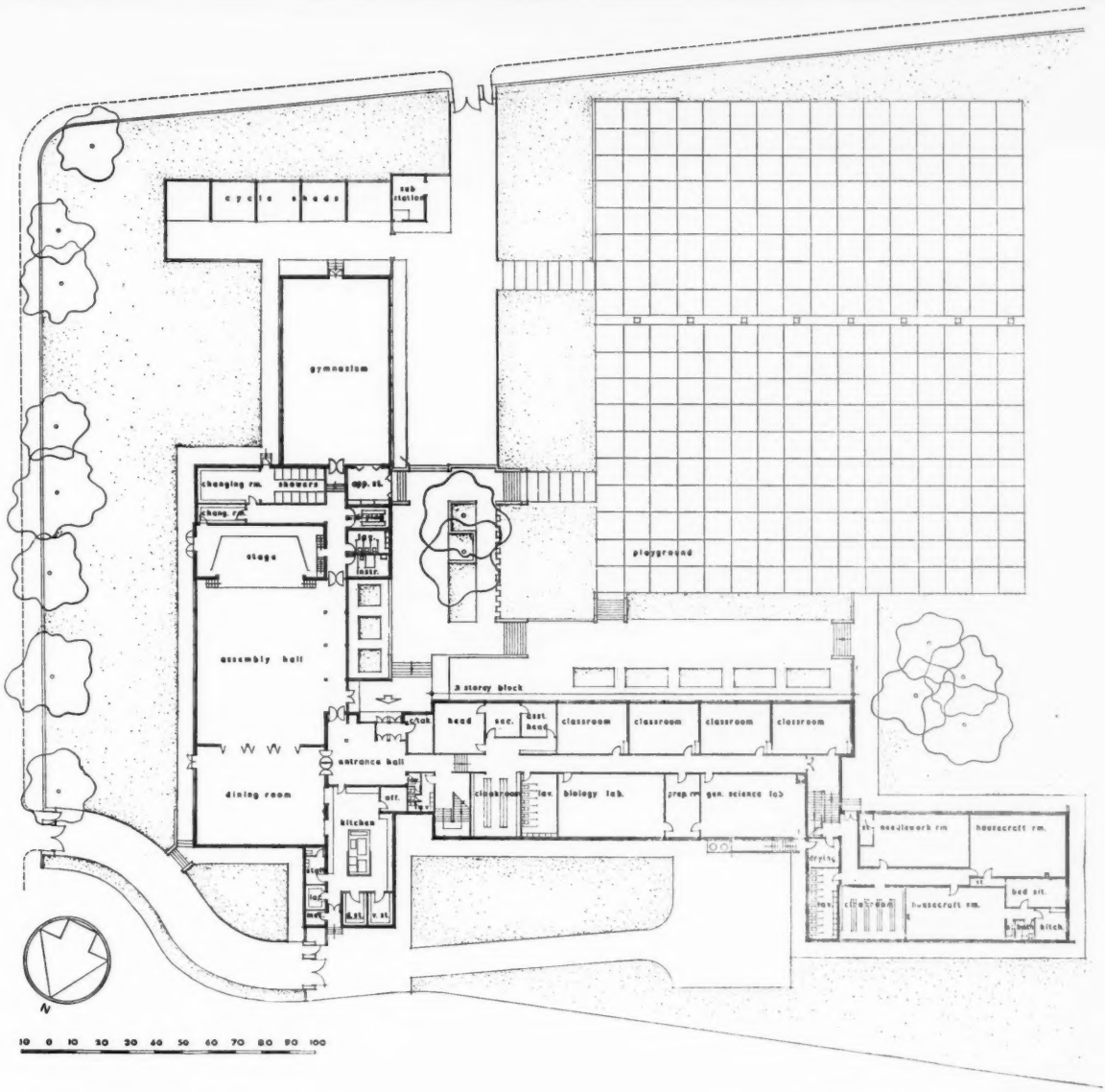


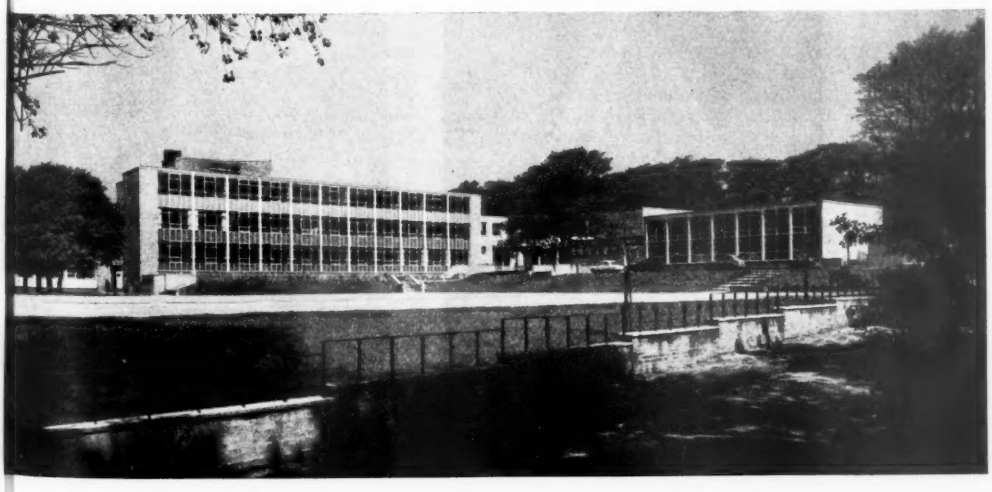
THIS BUILDING was awarded the R.I.B.A. Architecture Bronze Medal for the three-year period ending 31 December 1956 in the area of the Liverpool Architectural Society.

The plans for this new three-form entry grammar school for girls were prepared by Ronald Bradbury, City Architect and Director of Housing, and taken to the approval stage. At that point, owing to the total load of the city's educational building programme proving so heavy, Messrs. Herbert Thearle were appointed as architects to complete the project in collaboration with the City Architect.

The New Heys School is built on one of the most attractive sites within the city. It is basically a three-storey classroom block with the remaining accommodation, excepting the library, of a single storey at ground level. The shaping and siting of the blocks across the gentle slope were given particular care initially by the City Architect so as to enhance the natural beauties of the setting and to retain the various groups of large trees. Landscaping features embodied by Messrs. Thearle, in addition to the existing trees and shrubs, are the plinth walls serving as ground ties to the several blocks and the cast concrete garden ornaments which considerably enliven the scheme.

Lightness and elegance of detailing throughout—so far as was compatible with efficiency—has been the measure. Even the utilitarian sub-station and cycle shed, while still recognisable but not offensively so, have been humanised and take their place in the general architectural ensemble. Externally patterned brickwork and internally decorative wall tiling and ply panelling have been





employed in carefully selected parts to provide interest in a reasonably economical manner.

Colour schemes, although chosen to give a feminine character to the building, have been disciplined and though varied a common denominator has been imparted by painting all the woodwork, apart from the doors, in a serviceable yet attractive grey shade.

This school is a good example of collaboration between official and private architects.

The tender for the New Heys School was £159,000 and the general contractors were Messrs. J. Jones (Woolton), Ltd. The quantity surveyor was Mr. J. Youdan Briggs of Liverpool.

A Flight from Functionalism*

By Professor Robert Gardner-Medwin,

B.Arch., M.T.P.I. [*F*]

Eric Mendelsohn: Einstein Tower, sketch, 1920. Prophetic expressionism

LAST SUMMER in Milan I saw some of the challenging new buildings which have been having such startling effects upon my students, and indeed upon many of the younger groups of architects practising in Britain.

From the magazines, which of course illustrate the most bizarre, one gets the impression that most of the Italian work since the war is of the kind which can be appropriately labelled 'sculptural formalism'. In fact, I discovered that there were comparatively few buildings of this kind. Most of them were the works of Luigi Moretti, who is perhaps the most theatrical architect building in Milan today.

Even the youngest Italian architects and students, it seems, no longer feel the earlier enthusiasm for Moretti's theatrical formalism: they are more deeply interested in the structural inspiration of Nervi, the rationalism of the early Rogers (I will explain the 'early' later), the integrity of Giuseppe Terragni's work of the late '30's and early '40's, and, in general, the clear expression of plan and structure in the work of an able body of architects and industrial designers such as those who designed the Olivetti headquarters in Milan (Nizzoli, Fiocchi and others).

Of course, there is great enthusiasm for Gio Ponti, but he is not so easily classified as formalist or functionalist. In his industrial design he is certainly functionalist (X-ray analysis of how a mouth negotiates a spoon; knives scientifically re-formed to resemble surgeons' instruments); but in his architecture the functionalism is far from pure; it is often mixed with playful juggling with forms, though usually with forms which have functional origins.

Triennale Testimony

It was easier to understand the abiding faith of the Italians in the functional tradition when one visited the architecture exhibition at the Triennale. This was the best-told story of the development of modern architecture that I have seen. After ascending a stepped hall in which were displayed structural models reminding us of the daring of Brunelleschi's Duomo and of some of the Byzantine and Gothic cathedrals, we entered a gallery of structural pioneers which began with Telford and Paxton and ended with Maillart and Nervi.

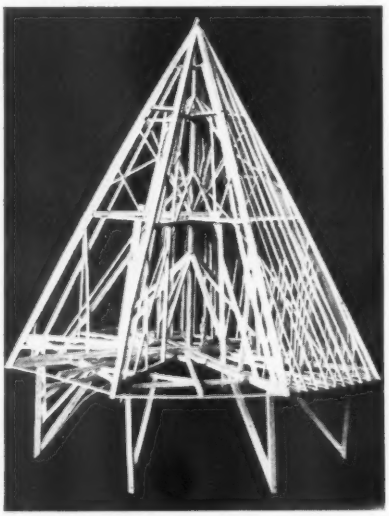
The exhibition established the vital *rapport* between engineering and architectural thought in all that is significant and notable in a hundred years of development. The moral of the display seemed to be that the most compelling forms in architecture are significant forms: that functionalism (in its broadest sense) is not a phase through which modern architecture had to pass, as some would have it today, but an expanding intellectual force, nourishing the creative mind and leading on, through scientific discovery, to new and unexpected forms of expression.

Every building or project in this exhibition was illustrated not only by photographs or drawings of its outward appearance (we have seen too many exhibitions like this), but by admirably clear plans and sections by which one could assess the analysis of the solution almost at a glance. The more obviously formalist works of the Italians (buildings in which modern forms are exploited for the sake of modern forms) were conspicuously absent. I suspect that most of them would not have survived the revealing photo-transparency exposure of their plans and sections. Frank Lloyd Wright's Falling Water and Le Corbusier's Ronchamp, which might seem to belong to the category of sculptural formalism, were given places of importance; but these masterpieces have the integrity of 'organic' architecture: they are poetic declarations of the nature of their materials.

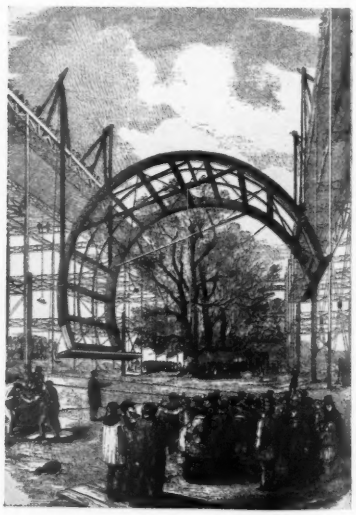
However, the inter-war Dutch formalism of Dudok and others (inspired by Frank Lloyd Wright but lacking his organic character), and the more sculpturesque post-war work of the Brazil formalists, were ignored. In the pioneer section, Eric Mendelsohn's early expressionism was shown, perhaps for the same reason as Wright's and le Corbusier's; and looking at his famous drawings one asked oneself if the latest realisations of Moretti—powerful, monumental, expressive—have anything more important to say than the prophetic projects of the young Mendelsohn. These two have much in common: both, for example, love drama and monumentality. But while Mendelsohn's projects anticipated the potential of modern methods, Moretti's realisations have nothing of this prophetic quality and seem to have been arrived at without any particular reference to methods which already exist.

Moretti was in fact represented in the Exhibition by an earlier building, his 1935 Academia di Schorma in Rome, in which Fascist dictatorship seems to have demanded a classical façade which gives the lie to the dynamic cantilevered shell section behind it. The showing of this building seemed to be an exception to the exhibition policy. Another exception, perhaps, was the showing of an early Terragni building. Giuseppe Terragni (who died in 1954) was one of the few outstanding Italian architects who refused to follow the Fascist line:

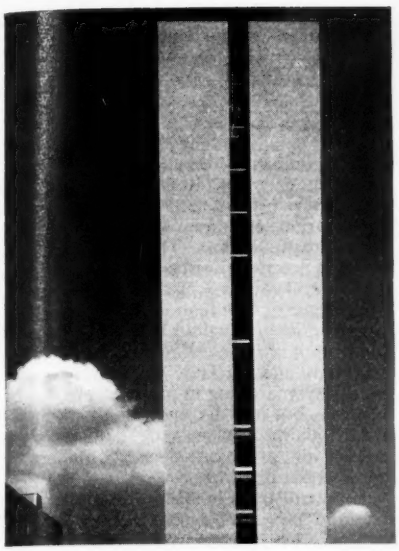
Framework of the roof of the Chapter House, York, made from a study by Dr. Quentin Hughes [*A*], Liverpool School of Architecture, for the Triennale, Milan, 1957

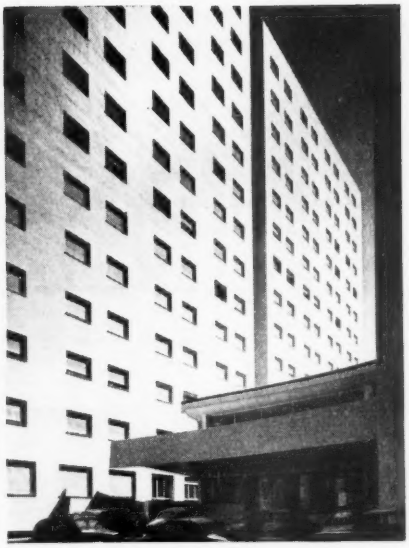


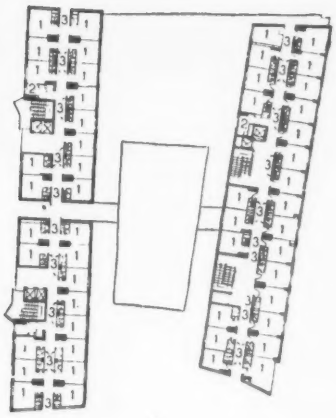
The Crystal Palace under construction. (*Illustrated London News*)

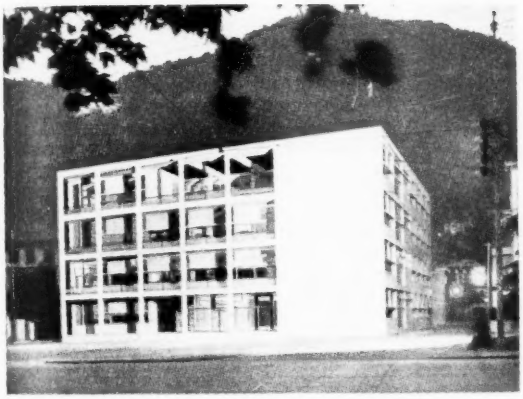


* Based on a lecture given to the Architectural Association of Ireland, January 1958.









Above: Casa Albergo, Milan, and upper floor plan. Luigi Moretti and Ettori Rossi. ('*Italy Builds*', *by G. E. Kidder Smith, Architectural Press*). Drama of 'sculptural formalism'

Left: Casa de Popolo, Como, 1932–36. Typical of Giuseppe Terragni's work in Fascist Italy: functional integrity, classical spirit

Below, right: Palm Olive office building, Milan. Luigi Moretti (*photo: R. M. K. Dunn* [*A*]). The 'sculptural play of forms'

a line which of course was also formalist, but in a rigidly derivative classical straightjacket. He and Pietro Lingeri were represented by a building of this period: the dramatic assembly of solids and screens which enfold an ingenious plan and result in a thoroughly human and personal expression of an art gallery which somehow simultaneously satisfied the Fascist programme—probably because of its suggestion of classical monumentality.

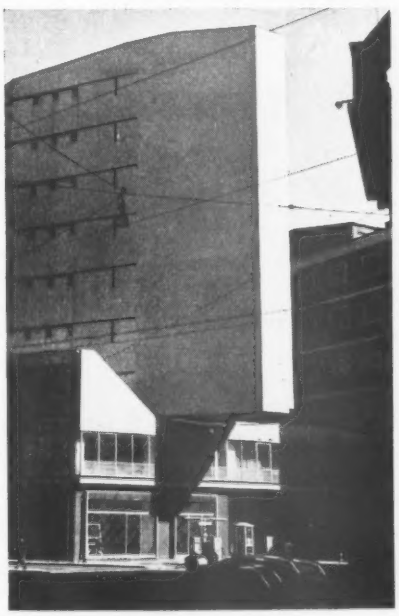
Free Functionalism

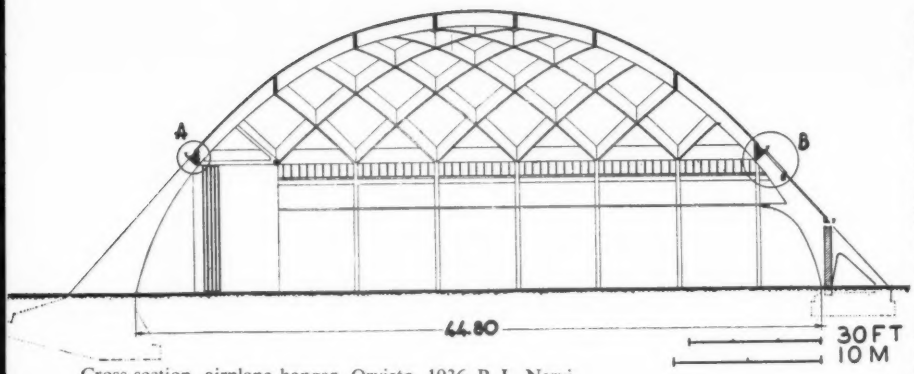
After following the story of the early pioneers one entered a darkened room in which more recent achievements sparkled from back-lit transparencies. The approach was through the triumphal arch of a model of Nervi's most famous space-frame hangar (one of those so unfortunately blown up in the war). This was large enough to stand up inside and, by crouching, to get an impression of its structurally inspired but deliberately proportioned, elegantly modulated vaulting, which links it to the traditional functionalism of Gothic.

Here is the source of a much more important, more deeply rooted influence on Italian architects, and indeed on architects in all parts of the world. If we are to give it a label we might call it 'free functionalism'; or perhaps 'structural expressionism' might be more accurately descriptive of some of the buildings which fall into this category, with their concern for logical planning and their passion for structural adventure. Such buildings are certainly in the functional tradition, but they have freed themselves from the strict prose of the early puritanical creed. They exploit the possibilities of their structural material and seem to express a poetic delight in it.

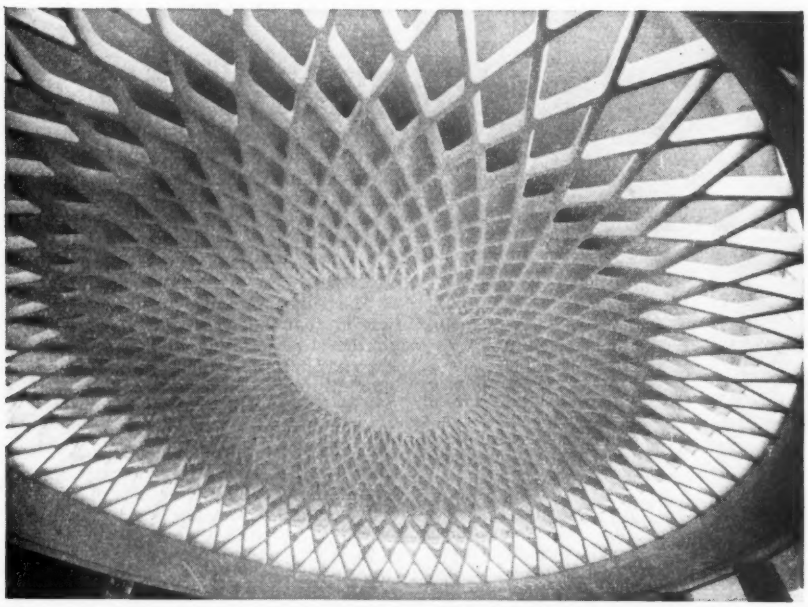
I have made a list which gives a fair idea of the types of recent buildings, other than housing, chosen by the Triennale architects from international sources to illustrate the theme of the architecture exhibition: the theme, as I interpret it, of greatness in architecture born of plan and structure. This list shows that Britain was at least represented by one recent building (Architects' Co-operative's Brynmawr Factory) which rubbed shoulders with factories by Nervi and Saarinen. It is interesting to recall that the designers of Brynmawr were fellow-students at the A.A. just before the war, when the passion for functional integrity in architecture was at its height.

The climax of the architectural exhibition was a great model of the Pirelli building, the 25-storey lozenge-shaped skyscraper, then half-way up, which promises to be the most distinguished commercial building in Milan, if not in all Italy: the kind of building for which we had hoped as climax to the L.C.C.'s spectacular South Bank Development. The Nervi–Ponti partnership should produce a building in which powerful structural expression is associated with

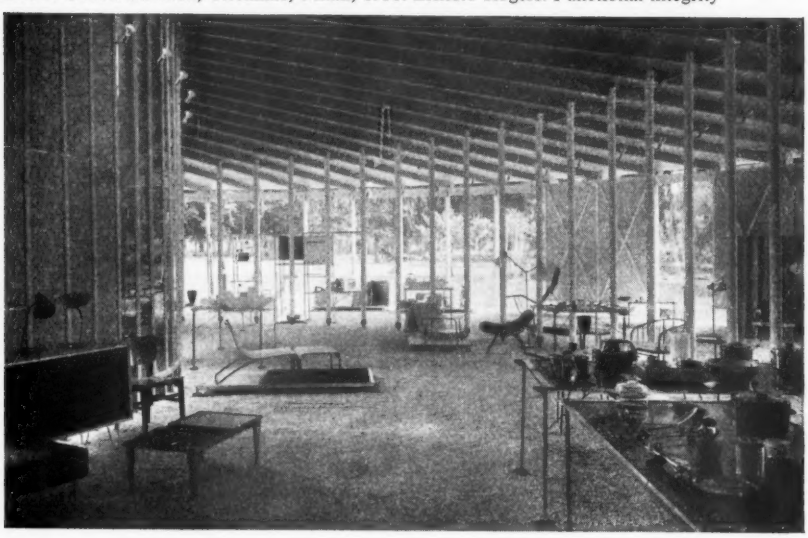




Cross-section, airplane hangar, Orvieto, 1936. P. L. Nervi



Above: Multi-purpose hall, Terme di Chianciano, 1952. P. L. Nervi (*photo: Vasari*)
Below: U.S.A. Pavilion, Triennale, Milan, 1951. Ernesto Rogers. Functional integrity



elegant detailing and industrial design. I shall return to this building later when I compare it with the Milan buildings of Luigi Moretti.

Milanese Modern

Skill in industrial design is reflected in the detailing of many Italian buildings, and high respect for the nature of materials seems to be keeping most Italian architects on a steady course. Their buildings are often as precisely finished as the Germans', but not always so precisely constructed, one suspects. Although more of them have a gay flourish, it would be easy to mistake many buildings in Milan for buildings in German cities. The Grattacielo (sky-scraper), so exciting in photographs, is one of these, but it is disappointingly mechanical in quality at close range and lacks the convincing precision of a good German commercial building.

Here and there in Milan the Italian zest for life rebels against the strict and orderly and becomes highly inventive and original. This can be seen in many shops and shop-fronts, in the new Gallery of Modern Art (by Gardella), in the work of Ponti and Moretti, and most vividly, perhaps, in the design of glass and ceramics. When one sees the late Fascist legacy of harsh, unbending monumentality in Italian cities, one is ready to understand the passion to break away from stern discipline of any kind and to play freely with the fascinating forms which have been unlocked again and lie strewn about the nursery of modern architecture. The surprising thing is that there has been so little irresponsibility—except at the lower end of the scale, where the most terrifying travesties of modern architecture have occurred.

Baffling rather than terrifying, and certainly provocative, is the latest building by Ernesto Rogers, the Torre Velasca. This is a tall office block in which the six top storeys project from the stem of the tower on concrete brackets, giving it the silhouette of a very Big Ben, or an absurdly blown-up version of the bracketed top of the central tower of the Palazzo Sforzia—the medieval stronghold which commands the main axis of the city. Apart from the fact that this could be explained as a cunning method of gaining more lettable space on upper floors without loss of daylight to neighbouring buildings in the lower regions, the modelling of the brackets is gauche, and far from convincing as structural form; the surface modelling of the façade is arbitrary, and the 'pinnacle' forms which crown the tower strike an incongruously romantic chord.

It is rash to criticise this building before it is finished (when I saw it in September 1957, it was still hidden behind the bamboo screens of scaffolding with which all new construction in Milan is mysteriously sheathed), but the combination of what could be seen then and the perspectives of what is to come, was enough to make one anxious about the latest developments of Rogers and his group who, in the early days, produced an exquisitely graceful

architecture which seemed to spring from a philosophy as sensitive as it was rational. It is with a sense of disappointment that one compares the relatively crude and irrational forms of the Torre Velasca with Rogers' U.S.A. pavilion of an earlier Triennale, and with his famous monument to Italians who died in German concentration camps—the symbolic cage which remains pure and evocative in spite of an atrocious new landscape setting among the gigantic, writhing memorials massed so startlingly in the Cimetero Monumentale of Milan.

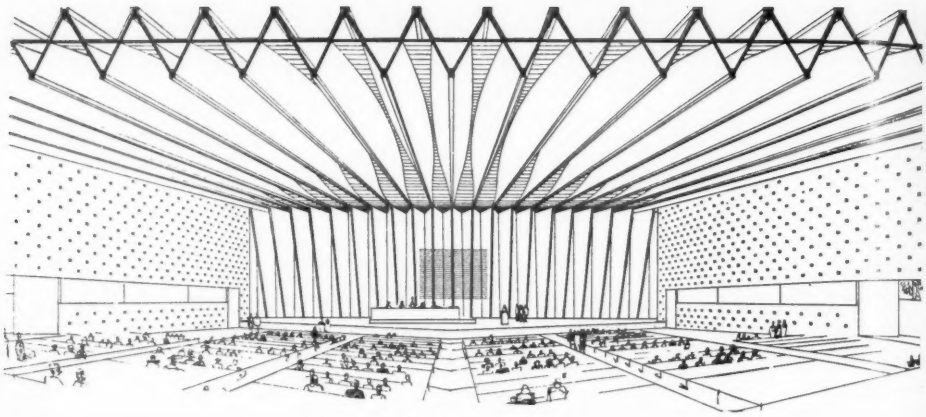
In the Triennale gardens another cage, a habitable one—the Buckminster Fuller aluminium and canvas geodesic dome which housed the American exhibit—has a similar purity but was more directly evocative: it symbolised the self-generating dynamic of functional thinking.

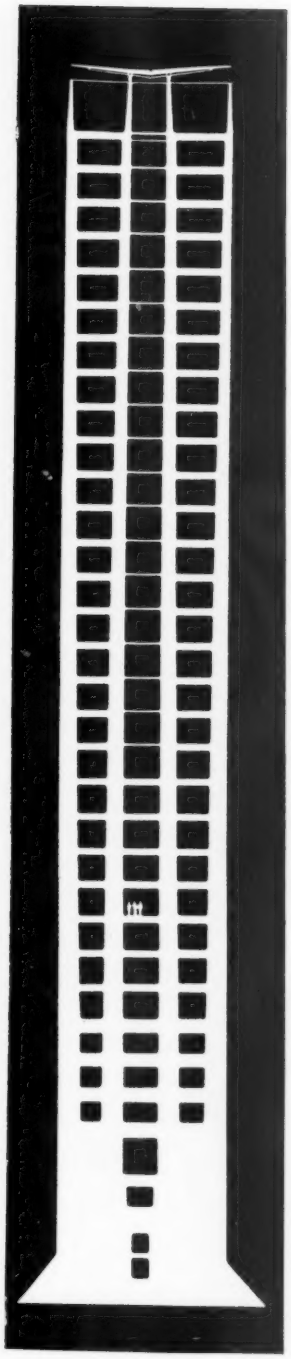
The Rogers' tower, and the latest office complex on the Corsa Italia by Luigi Moretti, are interesting contrasts with the Ponti-Nervi Pirelli building, which belongs to my 'structural expressionism' group. But while I am dismayed by the new Rogers I cannot help being excited by the new Moretti, although he belongs to the 'sculptural formalist' movement which I regard as leading us up a backwater away from the main river of architectural progress.

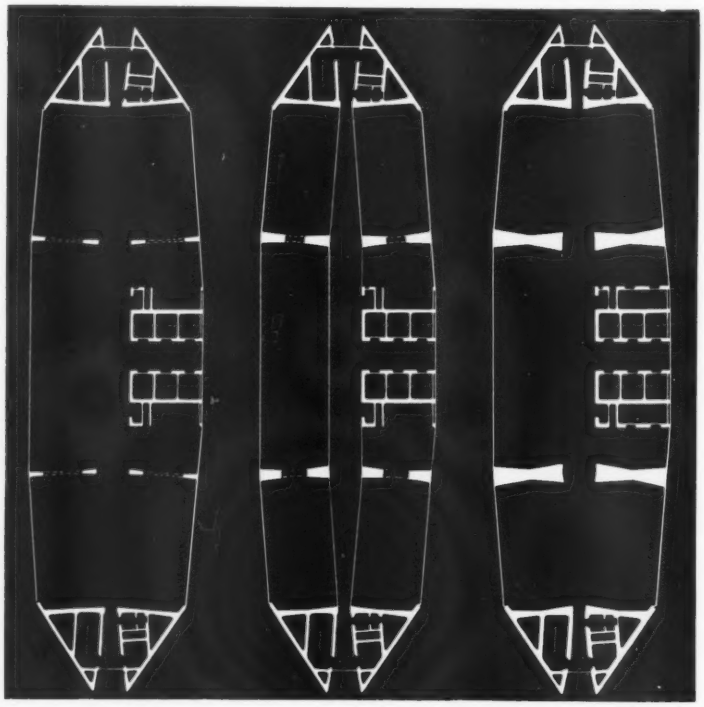
Moretti's two earlier buildings in Milan, the Albergo Americano and the Casa Albergo, are the ones which I regard as having affinity with Mendelsohn's early projects. They are stern drama: powerful declarations of the 'split slab' principle by which Moretti likes to surmount the boredom of a great mass punctured by an infinity of hotel bedroom windows. The narrow ends of the slab have deep slits corresponding with the width of the corridor (an absolutely logical expression of the plan); but not content with this, Moretti divides his slab longitudinally with another narrow slit, thus separating his plan, above the ground floor, into two distinct but closely adjacent parts. In the Albergo Americano there is a second smaller slab in which one end is narrowed by a slight chamfering of one of the side walls (another favourite sculptural device), and the two slabs are joined together by public rooms disposed under a butterfly roof. Over the entrance there are his characteristic suspended slabs with twisted curves, which make one feel that the builder has literally copied the rather wavering planes of the thin cardboard of the model (see page 409).

The whole building—this is true also of the Casa Albergo—is covered with whitish-grey mosaic, and there is no suggestion of colour on the exterior apart from the silvery glint of the mosaic when the strong light plays upon it. It is unrelieved drama of architectural mass, arresting but coldly uncompromising. The interior also forgoes bright colour, yet it is not a peaceful interior. Moretti's ordering of internal volumes in these buildings is not as competent as his ordering of external masses. There is an obsession with shapes

Torre Velasca, Milan, 1958. Belgioioso, Peressutti and Rogers (*photo: Studio B.B.P.R.*). A drift from functional integrity?

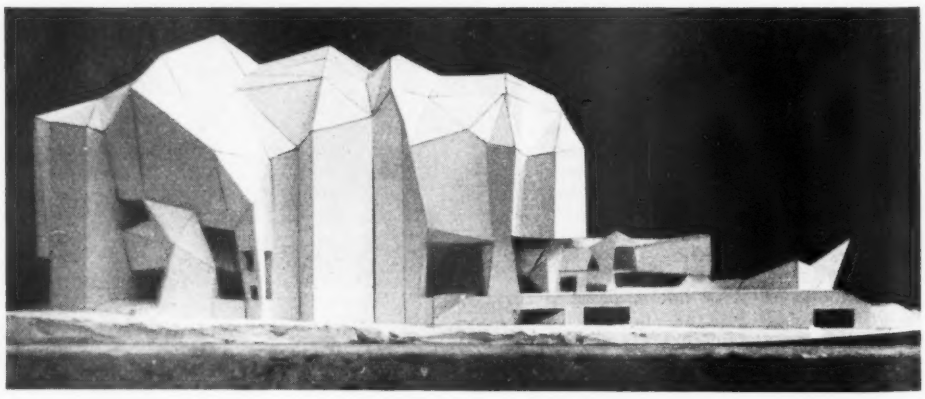






Unesco House, Paris, Conference Hall. Breuer, Nervi and Zehrfuss. This and the Pirelli building illustrate the principle of 'structural expressionism' (see page 414)

Office building for Messrs. Pirelli, Milan 1955–56. Section and ground floor, 15th and 30th floor plans. Architect: Gio Ponti. Structural advisor: P. L. Nervi



'A concert hall for Trafalgar Square', model. P. Drake, A. Lee and E. Reynolds, 4th year, A.A. School of Architecture (*photo:* E. Reynolds). A clear case of 'sculptural formalism'

Unesco House, Paris: Interior of Conference Hall, 1957. Breuer, Nervi and Zehrfuss (*photo: Unesco*)

as shapes in the ceiling sections and in the disposition of fixed furniture.

But there is much more humanity, warmth and colour in Moretti's latest complex of offices and flats in the Corsa Italia. The devices are all here again: the split slab, the tapered slab, the twist, the coil, the sculptural play of forms. But they are used to very good effect to solve the problems of an irregular site. For instance, the tapered lozenge slab, though it forces the internal planning, gives a sense of flow as one moves from narrow to wide spaces; the slit in the centre of the dominating high slab makes one aware of another space beyond, and on the shadowed side allows a streak of sunlight to enliven the prospect. This ten-storey slab, which is of very great length, is not only slit in the middle, but bent on plan in each of its halves. Seen from one side this gives it a concave effect which reduces one's angle of vision, gathering the building together in one glance, rather in the way that a camera gathers together a large group of schoolboys by swinging round in an arc. By the same token, when seen from the 'convex' side, the great bulk of the building is reduced by foreshortening. On this side, the split slab is seen in relation to two lower units which are nearly, but by no means quite, at right angles to it. One of these two lower units is a highly sculptured apartment block; the other, in contrast, an elegantly simple frame and glass office block which serenely reflects the splays and slits and tilts and curls of its exuberant neighbour. This building (the sculptured one) thrusts a sharp prow into the Corsa Italia and seems about to sail through the city. Long horizontal slits of windows forward (bathrooms and w.c.'s), and a bridge-like protruberance on the roof deck, add to the illusion.

Early functionalist buildings used to be described as 'like ships'; but this building is not so much like a ship as like the abstract image of one. It is as if the architect had dramatised the ship-like quality of modern architecture, consciously; indeed, one gets the impression that he has consciously dramatised modern architecture itself. The essential nature of sculptural formalism is an affectation of forms which, instead of being a derivation of the plan and structure of the building as such, is an assembly of abstract images suggestive of modern planning and structural techniques in general. Obviously this thesis cannot apply to every part of the building: the form of a window, for example, is bound to reveal its actual method of construction. But if one examines the modelling of such a building as a whole, one cannot escape the impression that one is not looking at modern architecture but at a dramatised abstraction of modern architecture.

Temptations of Sculptural Formalism

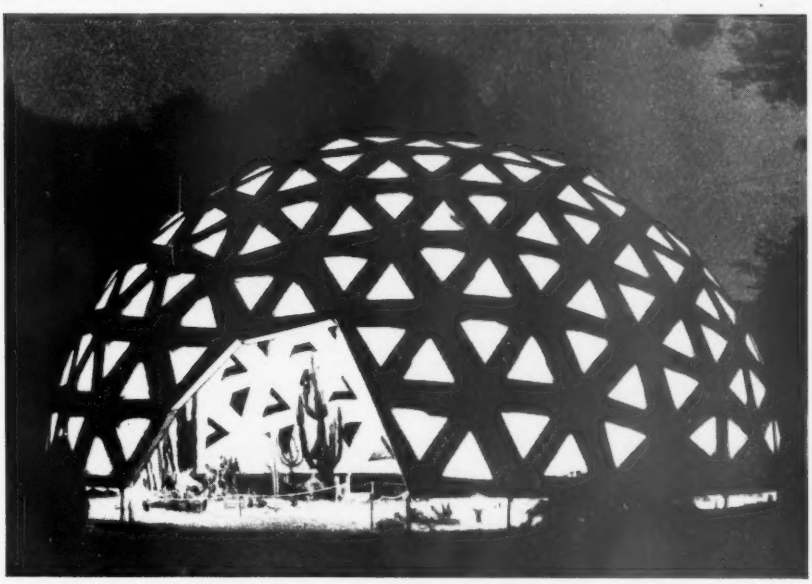
There is nothing immoral in this attitude to architecture, provided that the architect can rightly claim that he has solved his programme in a way which is not merely interesting but efficient; for certainly it is possible for a building to work well without laboriously expressing its function.

Nothing immoral, but plenty that is dangerous. The temptation to 'play' with architectural forms is considerable, particularly among students in schools of architecture who inevitably develop a facility for pattern-making long before they have mastered the science and technics of design. This is apt to cause despondency in all but the most structure-minded honours graduates in later life; despondency born of the frustration of never being able to produce anything so fascinating again.

But the movement known as sculptural-formalism not only has dangers for students; it has dangers for the progress of modern architecture . . . which perhaps, after all, is really the same thing. I have suggested that I regard this movement as a dallying exploration of a delightful backwater, off the main river of modern architecture. I hope I am right about this, for if instead it proves to be a change in the course of the river itself, I think it will be disastrous.

This sculptural formalism in Italy and Brazil, and when it occasionally occurs in Britain, has been likened to baroque; but it is a doubtful analogy. The renaissance of functionalism in Germany in the 1920's was a very different proposition from the classical Renaissance in Italy in the 15th century. Baroque was the exuberant climax (or decadent end, if one clings to the teaching of the '20's) of an architecture essentially formal and non-functional in concept. Sculptural formalism is exuberant, too, and it has some affinity with baroque in its relaxation of strict disciplines; but fundamentally it is a reaction against functionalism itself, whereas baroque was by no means a reaction against the renaissance. If it has a creed, it is 'go your own way and play to your heart's content'. This is fine freedom for a handful of brilliant designers, with a flair for architectural opera; but it is a chaotic creed for a movement. My fear is that if it were practised by architects at large, modern architecture would lose its directive power, its missionary zeal, and become discredited as a plaything.

In any event, baroque came to full flower some two hundred years after the



Geodesic dome, Triennale, Milan, 1954. R. Buckminster Fuller. (A dome similar to the 1957 Triennale model is the one at Kabul illustrated on page 423.) 'Free Functionalism'

beginning of the renaissance, while modern architecture had scarcely begun to take hold in Europe thirty years ago. Even allowing for the increase in the pace of life today, it seems a little early for either a splendid climax or a decadent end to modern architecture. We are surely only on the threshold of our new renaissance: we should not be impatient for a new baroque, even if we have any reason to anticipate such a repetition of history; which I doubt.

Thirty years ago, as Lewis Mumford puts it in one of his NEW YORKER 'Sky line' articles, 'the lines were clear and the direction was obvious; the tide of historical imitation had ebbed, and the turn towards a clean, bright, austere, efficient modern form had begun. The modern was then easily defined; it was that which did justice to the virtues of the machine—the precise, the calculable, the economic . . . the great cylinders of an American silo were the Doric columns of a new age'.

It was inevitable that there should be a reaction against such an icy philosophy, and I think most of us who felt the enthusiasm of polar pioneers for the new architecture in its early days, knew that a warmer front was bound to come. New freedoms have been explored since the war, and by no means all of these have abandoned the functional creed: they have simply made new interpretations of it, finding new freedoms in its truths.

'A question of morality,' said Le Corbusier at the start of the modern movement: 'lack of truth is intolerable, we perish in untruth.'

There are many brilliant young architects today who can design in perfect freedom and yet still adhere to that doctrine, simply because they feel an instinctive need for a discipline of this kind.

What the sculptural-formalists have to guard against is that they do not drift so far from functionalism that they approach the 'accidentalism' of action painting. The 'method' of one action painter was described by an ARK critic* recently as one who 'makes his pictorial and spatial drama in terms of colour patches created part by accident, and part by conscious effort after cognizance of the significance of the accident'. I hope, if only for our clients' sakes, we shall be spared this method in architecture.

One of the dangers of the present formalism is that it tempts young architects to think of buildings in terms of sculpture and painting: a habit of mind which can lead to more successful results on the drawing board than on the site. If we allow form to become detached from function we lose what Le Corbusier calls the *truth* and Frank Lloyd Wright the *organic* in architecture. These two temperamentally opposite masters are at one in recognising that the art of architecture emerges from the nature of the programme, of the materials, of the site.

I may well be reminded here that the new architecture had formalist tendencies from its very beginnings. This is true, particularly if we recall the work of Mies van der Rohe, from his Tungenhaut house to his Illinois Institute of Technology. The formalism of van der Rohe is akin to the strictly disciplined formalism of the Renaissance. His work has been admired because it provides two simultaneous pleasures for us: it provides in purist essence that which our educated taste approves in the geometrical proportions and rhythms of the Renaissance; and it expresses with exquisite refinement (though not always with truth) the precision and perfection of industrial techniques. We find this combination so irresistible that we can scarcely bring ourselves to criticise van der Rohe for forcing his plan and bending his structure to suit his pre-conceived pattern of *functional* formalism—a phrase which I think we can apply to the work of van der Rohe and some others to distinguish it from the *sculptural* formalism of the Italian and Brazilian schools.

In England, the Tecton group slid from pure functionalism to sculptural formalism, and their later London work has had a marked influence on the present generation of A.A. students. The caryatid porch on the second Highpoint flats was the first signal of this formalism; and the recent blocks of Paddington flats, with a concrete 'curtain', arbitrarily abstract, disguising the true pattern of the cellular slab, are an example of this cosmetic attitude to architecture by two ex-members of the Tecton group.

All interesting architecture has what is described as 'formal qualities', regardless of the extent to which function influences the form. The distinction I am making is between two opposing modern tendencies: the one in which form is exploited for its own sake in a manner which can be regarded as sculptural rather than architectural ('sculptural formalism'); the other in which form is an expression of the structural solution of the programme ('structural expressionism' or 'free functionalism').

The first seems to me an abandonment of the functional tradition in modern architecture, the second an extension of it. Both have exciting possibilities, but if our most promising architects abandon the functional tradition in its youth, I believe that the vigour of the movement will decline and wither for lack of sustenance.

The Ponti-Nervi-Breuer Axis

I now want to describe two buildings—one in Italy, the other in France—which I believe are examples of free functionalism, although at first sight they have a *joie-de-vivre* that makes one suspect sculptural formalism. One is the Ponti–Nervi Palazzo Pirelli; the other the Breuer–Nervi Unesco building. Both were under construction when I saw them, but they were near enough completion to judge their character.

The concept of the Pirelli tower is evident at once from its plans and sections. It was good to start the tour of this building at the base of its two tapering spines. The giant spreading roots of the structure are visible in the basement, eloquently declaring their thrust and spread. The shuttering had just been struck from Nervi's vigorously 'organic' tree-like vaulting of the basement conference hall, whose roof forms a podium for the tower. The scene down in these depths, with the engines of construction still in evidence, had the superhuman scale and drama of a Piranesi drawing.

The lozenge shape of the tower, with its Moretti-like deep slits at the ends, might be taken for affected formalism at first sight. Indeed, the plan and section of this building cannot be described as functional in the strictly economic sense of the word; yet the whole is essentially a structural concept, adapted to a logical and beautifully articulated plan. Structurally, it is a daring experiment, deeply satisfying because it seems to echo the structural logic of natural forms. This building is essentially in the class of 'free functionalism' and possesses also the quality of 'structural expressionism'.

I feel the same about the Unesco building. The twin conference hall unit is a brilliant exploit and a clear example of structural expressionism. The folded slab has been applied not only to the roof but to the inward-sloping supporting walls at each end, where it is boldly expressed externally and internally with direct simplicity and with a sense of scale and drama most appropriate for the occasion. This building glories in the rugged eloquence of concrete and is a magnificent example of the power of architecture to move men's minds. Breuer, left alone, is often tempted to play with his materials in a gaily illogical, fanciful way, though at his best he works in the organic tradition of Frank Lloyd Wright. In partnership with Nervi, he has allowed himself to be at once disciplined and inspired by the mathematics of structure.

These two buildings are a marvellous reminder of the endlessly developing potentialities of structure, and of the powerful influences of scientific method on architectural form. They are a reminder, too, of the affinity of architecture and structural engineering, of science and art. They should inspire us to a greater comprehension of structure and a keener scientific attitude to design. If we are to produce great architecture in a world now on the threshold of still more startling scientific and technological advance, this is the worst moment to take flight from functionalism. If we indulge in form for form's sake, retreating to architects' architecture, our work will cease to have any significance for our age, and soon, in payment for our irresponsible independence, we shall find ourselve forced to surrender the poetry of architecture to the trade catalogue of technology.

To be functional in the purely practical sense is an important part of an architect's responsibility; but it is not enough. In this scientific age we shall do well to remember that the secret of greatness in architecture lies deep in the roots of the functional tradition.

* In the JOURNAL OF THE ROYAL COLLEGE OF ART, No. 20.

The R.I.B.A. Discourse, 1958
Experimental Probing of Architectural Initiative

By R. Buckminster Fuller

given at the R.I.B.A. on 5 June

Mr. Kenneth M. B. Cross, President, in the Chair

Sir HUGH CASSON, M.A., R.D.I., [F]

A year or two ago, the R.I.B.A. Council decided, at the suggestion of the Public Relations Committee, to invite each year a designer or a distinguished person in the architectural or related arts to deliver to the members and guests an address to be known as the annual discourse. This wholly admirable decision was at first regarded with some misgivings. There were those who said that the supply of men of distinction would run out even more quickly than the whisky which, in the advertisements, they are often seen to be consuming. But we have persevered, and tonight we can count ourselves very lucky in having captured for our collection so outstanding and remarkable a phenomenon, if I may so describe him, as Mr. Buckminster Fuller.

He has been variously described in public as an engineer, a mathematician, a chemist, an inventor, a designer, a writer, a philosopher, a scientific idealist, a prophet and a crank. I have no doubt that if you gave him time he could add to the list, but I believe that he prefers his own title of 'comprehensive designer', a name to which, after some 40 years of original thought and most lively invention in all fields, particularly spherical geometry, light alloy fabrication and the chemistry of plastics, coupled, of course, with—to us as architects—his more famous experiments in transport and housing, he is surely as much entitled as any man alive.

We welcome you most warmly, Sir, and we are glad to see you here in such good shape, but I must confess to a little disappointment or surprise that your shape is roughly that of other men and that you are not built on geodesic principles! We look forward most eagerly to what you will have to say. On behalf of the President of the R.I.B.A. I have the honour to invite you to deliver the annual discourse for 1958.

THE DISCOURSE

WHEN I WAS ASKED what I might discourse on, I thought that inasmuch as I have learned over a period of years not to prepare any talks, I must resort spontaneously to thinking out loud regarding challenging patterns emergent from my life's experience, because that is what we really have some preparation to talk about.

For instance, I have been concerned for a great many years with the potential functioning of the individual in the presence of swiftly integrating world affairs and the increasingly massive states, and massive corporations, and their respective enormous capital advantage in respect to the accrediting of initiatives in any directions. I am sure I am but one of several millions who wonder how much the individual can actually affect the evolutionary processes of his day, while starting only upon his self accrediting of his own initiative, enterprise and effective transformation capabilities.

In 1927 I decided to experiment and probe in this direction by gathering data on how much the contemporary individual might be able to effect. In 1927 I had come to the end of some very vigorous experiences in the world of building activities. I had taken part in the building of two hundred and forty buildings between 1922 and 1927. I had had a very vigorous experience in the American scene regarding this kind of activity. And that building activity followed directly upon experiences in the Navy with its then new world of flying and the new world of radio, it also followed other experiences in mechanical activities. And my conclusions after five years in the building world were that the building world, through no fault of its own nor of its own choosing, did happen to be the last primary area of man's activity yet to come importantly under the effect of the industrial equation which had been coming over all other world technologies and economics for at least a hundred years. And it was also very clear, I thought, that the superior capability of the industrial equation was approaching inexorably to embrace all of mankind's productive techniques and therefore that it would in due course come into availability for direct solution of men's immediate living problem rather than as an aftermath diversion of war-born technologies. Industrialisation had been applied at first on very high priority, due to its relative scarcity and enormous initial cost, only to great emergency problems of war and the annihilation of life. And I thought, because I, as an individual, had had the high-priority industrial technology experiences in the mechanical, Navy and aircraft worlds and then subsequently had had the non-industrialised experiences in the building arts that, whether I liked it or not, my experiences taught me to see the differences between these industrial and non-industrial capabilities and therefore as an individual, inasmuch as I saw those differences, there seemed to be some responsibility of initiative-taking attached.

Therefore in 1927 I decided to peel-off from conventional livelihood preoccupations and to enter into a period of research and development, the minimum limits of which turned out in no time at all to be very clearly and obviously of many years' duration. In fact the first prospecting into the ramifications of such a researching initiative pursued alone as an individual, indicated that there was a minimum of twenty-five years of detached reconnaissance activity before the individual might be able to bring into industrially useful economic harvest any of the kinds of initiations that he might undertake within these vast new evolutionary premises. The reason I say that is that feasibility studies that I originally found myself making showed that there were many different kinds of unfamiliar gestation lags in respect to final birth patterning within the industrial equation. Whereas in the agricultural world we tended by historical experiences to think of crops coming in annually, we also tended to expect profits 'annually' in

respect to the industrial equation. However, I found that there were a variety of multi-year lags between the various industrial inventions and their respective active introduction into the industrial world as new tools, structures and processes. For instance, in the railroad arts, there was an average of fifteen years' lag between invention and the incorporation of that invention in the railroading arts. The lag was much shorter in the radio world—only about two years—and in the airplane world about four. In the world of building I found an enormous lag—approximately 42 years. Typical had been a building arts invention at the time when mass production of steel by industrialising man begins. Mass production steel was very different from the previous making of steel by man which had dribbled along for centuries as a fine art. Production steel ushered in the civil wars of the mid-19th century. In the mass production of steel Portland cement became a fundamental by-product of the complex steel-making activity. It was, however, forty-two years between the production of Portland cement as a by-product of the steel industry in America before anybody thought of putting a piece of steel into the cement thus to make reinforced concrete. This is very typical of the building invention lags.

Integrating all the different kinds of lags in the industrial equation ranging between 42 and 2 years and weighting the total inventory of categories in the terms of their respective total dollar volumes in respect to the total annual activities, it appeared that there would be a 25 year lag instead of a 42 year lag to be anticipated in relation to shifting 'building' category over into the industrial equation column and out of the craft arts columns.

I am going to examine the craft arts in contrast to the industrial equation in search for working definitions. You may have other definitions for *craft* v. *industry* that you prefer, but when I use these words I mean the following:

Both craft and industry deal with extra corporeal work capabilities greater than those that are integral to the human organism, therefore both deal with tools. The craft tools I define as that unique class of tools which can be spontaneously fashioned and adopted by any one individual starting nakedly in the wilderness—for instance, his spontaneous picking up of a stone to do work at distance greater than his arm's length; or his picking up of a stick, using the stick either as spear or as lever. Industrial tools, I define as tools which cannot be produced by any one man. Those definitions seemed to me to provide a rather sharp differentiation. But adoption of the definitions brings surprise lines of cleavage. Let me take the case of the hammer—the man in the woods certainly would be prone, having thrown stones and probed with sticks, to take a crotched stick and lash a stone in it making a hammer with which he could deal a blow greater than that accomplished with his fist. So we might say a *hammer* belongs categorically to 'craft'. However, I looked at a modern carpenter's hammer and I found that this modern carpenter's hammer, made out of forged alloy steel, does involve finding in the first place iron which would not probably be in the vicinity of the man in the woods, and it does involve a knowledge of how to mine the ore, to render and produce not only the iron, but to find and render the manganese, nickel and molybdenum in far away lands and to bring all together. Therefore invention of ships is involved in the bringing together of many metals, and there is also requisite the invention of blast furnaces, forges and so forth. Obviously, the modern carpenter's hammer cannot be produced by one man, and is therefore industrial—so there are both craft and industrial hammers. While hammers took a little exploring we can take other cases, such as a steamship, the *Queen Mary*, for instance, which obviously cannot be produced by one man, operated by one man, used by one man. So, what I mean by the industrial tools then, are tools which only relate to the integrated capabilities and initiatives of a plurality of men. With that basic distinction I then discover many other and very important differences between the crafts and industry, as for instance, craft is inherently local—local in time and in the generations of man. It is local geographically in the small ecological swingaround of the individual, it is very local, then, in knowledge.

In contradistinction then to this *local* time and geography and knowledge aspect of craft, we find the industrial equation does represent an integration of all the knowledge of all human beings, as gained from their plurality of experiences, and as relayingly communicated by man one to another. Industrialisation represents an employment of all the resources of the earth, wherever they may be. It is inherently *comprehensive* and *universal*, in contradistinction to *local*. And this is the reason why I have adopted the word *comprehensive* as unique to my kind of exploration.

Now then. The industrial equation goes inherently, ergo inexorably, around the world to find the various excellences of unique behaviours of respective elemental resources for the reason that tools are only adopted by men to help them to do greater or more incisive work than that to be accomplished only with their integral physical member capabilities. Out of men's integrated experiences, there is regenerated an accelerating realisation of ways in which they can improve workable advantage over the progressively evolving physical environment.

In no time at all we begin to discover that not only in our own wanderings but also in the reports of other men there are unique materials elsewhere which if added to what we have locally, could give us greater performance capabilities, such as unique lightness combined with a unique new degree of hardness. We also begin to discover that by travel and commerce we might be able to bring together extraordinary new complex capabilities. This industrialisation as the total integrated complexity of advantage gains grew slowly out of the progressively and regeneratively integrated information of man.

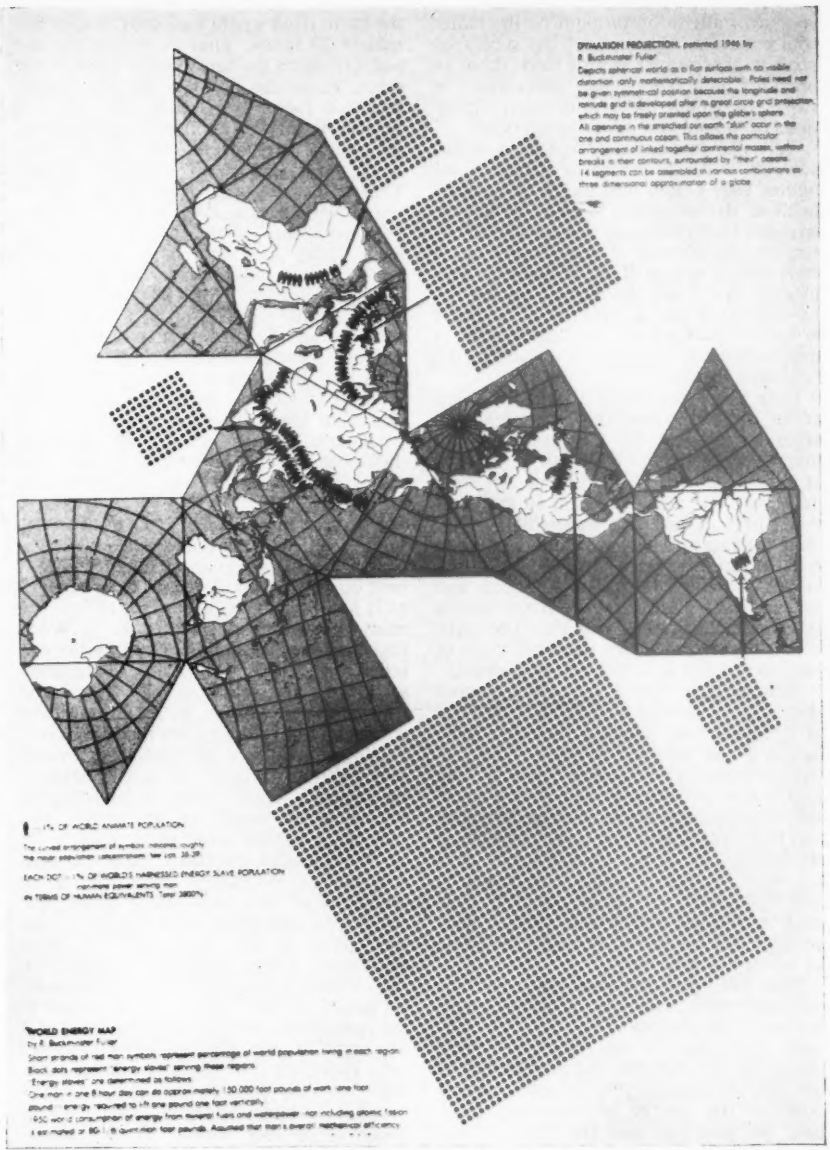
Unquestionably we would say that words are the first industrial tools for inherently they involve a plurality of men and are also inherently prior to relayed communication and integration of the respective experiences of a plurality of individuals. Due to the fact that nature has disposed the chemical elements around the earth in very uneven manner, recourse to the total physical resource inventory of unique behaviour advantages to be earned by integrating the totally relayed information does involve man's going all around the earth, which means that starting from any one point he has to go half around the world—which is always the length of his journey to reach the furthermost earth surface point. The industrial equation therefore always involves going half way around the world and then separating out the desired resources from their matrix, and thereafter a set of progressive separations and progressive centralisation movements of the unique resources towards the original area where you would wish to bring about the highest separation where you have already established a complex of tools. Finally on reaching the home tool complex, the resources from far and near are separated out to the maximum degree. Men then begin to reassociate the various preferred performance characteristics of these various resources in preferred complex patterns thus to accomplish greater or more incisive work. Having done so the environment itself becomes permanently altered. The world never returns to the shape that it was before. It is important to realise that the industrial equation has really altered our physical world relations, the major geophysical patterns, in ways and degrees possibly greater than are popularly realised, as for instance, England was first exploited by foreign men, the Phoenicians, who discovered England's tin. Then came the Romans because this low-melting-point metal suddenly opened up new technical capabilities, therefore economic wealth. The tin ore was finally exhausted here, yet so much machinery of reduction, production and commerce had been developed around it, that tin was sought elsewhere by the now complex Englishmen who, going half-way around the world from England, found tin in the Malay States, Bolivia, Tanganyika and so forth. In America we have no tin ore of workable grade or amount. In the industrial equation we need enormous amounts of tin for many kinds of special abilities and tin opens up over and again all kinds of new ventures in industry. For instance, as babbit or bearing metal it first permitted the industrial wheels to go round.

So much tin was gradually brought into America, and so easy is it to recover, that America's cumulative inventory of available tin has finally become a major world body of the tin reserve. In our aircraft industry today, because it is predicated on very swift changes of design and is a swiftly evolving art, we have so-called soft tools

to make possible short runs of entirely new designs—you do the same here—and we learned from England how to make our Kirksite tin-forming dies. And back of every aircraft company in America you will find an enormous store of tin in the form of obsolete dies soon to be melted to form new dies. These tin die storage yards look exactly like large graveyards but are far more useful. In fact the largest inventory of tin in America is back of our aircraft plants. And there is so much of it there now that the actual tin in concentrated form above ground in America is so great that it is approximately equal to that below ground in Bolivia and the Straits Settlements. That is to say we have in America the largest tin mine in the world all above ground.

So here we see major geophysical patterns of man's earth irreversibly altered. I have only given you one typical case of a myriad in which the earth will never be restored to its previous patterns.

When I was nine years old the airplane was invented, and it was a very extraordinary kind of experience of fundamental change. I was amongst the thousands of millions of young boys trying to make some kind of a little device that would fly. And suddenly there it was. When my daughter was born in 1927 I was pushing her baby carriage in Lincoln Park in Chicago, because at this time I had started in on this research programme and I didn't have any other every-day business so that I had time to push the baby carriage. As this was in 1927, you must remember that this was the year of Lindberg's great flight. The night air mail was not to be flown out of Chicago until two years later, 1929, so it was a rare event indeed that as I pushed my daughter's baby carriage a little light plane flew directly over and I said to myself: isn't that amazing that unlike myself my child is born into a world in whose sky there is an airplane as an *a priori* universal event. How different that universal relationship eventually became even though we didn't see another airplane there for the next two years. But a quarter of a century later, which was five years ago, my granddaughter was born in New York. I would like to mention my daughter's and granddaughter's names—my daughter, born in 1927, is Allegra, and my granddaughter, born in 1952, is Alexandra—and Alexandra was born in New York City and she was brought by her parents from the hospital immediately to the apartment, where they lived at Riverdale just across from the northern end of Manhattan, which is quite a high point of land. And this point was directly in the path of the take-off pattern for both of New York City's major airports—La Guardia and Idlewild—and their westbound American continent flights. The planes were going over frequently, sometimes every few seconds. There was the familiar roar and, on such a high promontory, it was a very important fundamental event to a new life. The interesting result was that my granddaughter's first word was not 'Mummie' or 'Daddy', but was 'air'—short for airplane. She was born in the fall of the year



1950 data. World Energy map designed by R. B. F., redrawn by Herbert Bayer, 1943. Each small figure represents 1 per cent of world's animate population. Each dot represents 1 per cent of world's inanimate power serving man

'Because I was interested in an air-ocean world town plan I went into many studies of mathematical projections and ways in which we could see the earth a little more ably. . . . I found a way, then, of projecting the earth in such a manner that you could see it all at once and without any visible distortion of the relative shape or sizes of the components . . . so that we had in effect one world island in one world ocean, which would then be the great unitary landing-field for the great air-ocean world'

and though they had a little balcony on their flat looking out upon some trees, the fact is that she saw many thousands of airplanes before she ever saw a bird, and the airplane was much more normal in her sky than was a bird. As I realised and thought about this, I wondered if there were other important *a priori* changes, and I looked at the books that were given to my granddaughter, and I saw that these books were the same kind that I had when I was a child—they were full of donkeys and pigs and goats and cats—but my granddaughter had never seen a donkey or a goat or a horse! And these were just as unfamiliar to her as if you showed her microphotography of germs and cold bugs. What had been normal to me was abnormal to her. She was very kind to us about it and was politely amused at the things we were showing her, but they had no relation to reality! This accelerated progression of

a priori universe alterations is typical of the very swift alteration brought by the industrial equation. Disparity of the successive present generation's norms from those of previous and yet living generations is swiftly widening the gap between aspirations of the old and newer generations.

To make this disparity and its potential solvability clearer for study I made some figures that I now find useful in comprehending the enormous velocity of change wrought in our evolving relationship to our respectively altering *a priori* universes. I start with a sphere 20 ft. in diameter as a model—that'll be the largest model we have to think about. And the 20 ft. sphere is meant to represent the relative rate of negotiability of the earth as gauged by the following figures.

First I have supposed a path to be put about the earth, there being no dry path around the earth, but I want to allow a man to walk around the earth at the rate at which the Army says a man can walk daily, and rest and feed. And so the earth that I have chosen, this largest ball, represents the rate at which he would be able to walk around the earth. Then I give him a horse—the horse also has to sleep and rest and eat—and, using the Army figures again, we find he can negotiate the earth with a horse so fast that the relative size of earth is reduced to a ball 6 ft. in diameter.

Now we give him a fast-sailing clipper ship and the earth comes down to the size of a basket ball. When I obtained these figures I was amazed to realise the historical economic advantage that a man with a ship had over a man with a horse and how much greater advantage they both had had over a man on foot, throughout all history. The clipper ship, of course, was a tool; it was the first really large industrial tool that could not be produced by one man. And it did not have to stop to sleep at night like the horse, but kept on going 24 hours day after day.

Now when you give men railroad trains and steamships, which can negotiate about the same distance daily, because the railroad train has to be replenished very frequently, we find that the relative size of the rate of negotiability of earth comes down to the size of an American baseball. We give him now the DC 7, or the Super Connie air-transport and the relative negotiable rate size of the earth comes down to the size of a golf ball. Taking the new jet air ships, which will start in service next year, the relative size of man's negotiable earth comes down to the size of a three-quarter-inch marble. Projecting the present rate of acceleration of commercial air transport speed for just ten years and taking the figures now adopted for 1968 by the International Aeronautical Union and the U.S.A. Air Force, etc., the relative size of man-negotiable earth will be the size of a pea, and that is the smallest we need now to consider for it will inaugurate an entirely new era of man around earth. The new era may be discerned as follows.

As of the inauguration of the jet ships next year, any who have looked at the schedules know that they are going to be able to go the furthermost points around the earth from where they start in approximately 20 hours. That is, within the day you can reach the furthermost point of the earth. Projecting for only ten years more, you find the speed is such that you will be able to leave your home any morning, go to any part of the earth to do your day's work and come home for dinner. That is just ten years from today. And if our definition of a town is a place where you work and sleep, then in ten years from today we shall have a one-town world. What has been a theoretical and idealistic concept will be stark reality. These are the consequences of altering the relationship of man to his environment as uniquely brought about by the industrial equation—an alteration utterly impossible to craft capability. While we in no way deprecate the extraordinary craft accomplishments of men, we do see the great difference in the relative economic and social effectiveness of the industrial and craft tools.

I became interested in 1927 in discovering in what way the enormous advantages of the industrial equation might come to bear directly on man's means of living even as it had already been brought to bear on mass production of ways of dying. When first employed this industrial capability was inherently very scarce, scarce in material, scarce in ships, scarce in men who would know how to employ it. Its scarcity and complexity of tool-up costs made its initial employment almost prohibitive in overall cost, therefore only in great national emergencies, underwritten by mortgaging of whole sovereign states, could men muster the capital credit to inaugurate use of the industrial equation. These national emergencies we know were the great moments of war, and under those war conditions high categorical priority of use was given to the application of those exquisitely scarce industrial capabilities. And in setting these high priority schedules we hoped to keep the war to be joined as far away from home as possible, because if the joint of war reached home you had lost. Therefore priority of industrial capability went to the establishment and support of the longest ranging arm of highly energized hitting power by the world-integrated network of comprehensively designed industrial capability, which must first of all produce the navy and transport to rule the seas which covered three-quarters of the earth and divided all lands and therefore controlled the principle of longest arms of hitting power.

Under these conditions nothing could be more immoral than the idea of using any of the very scarce capabilities to build for oneself a better home during the time when you are sending your boys away from home to man the long arm of hitting power.

During war there has then also to be an anti-priority, and we have found out in the great emergencies over and over again that the anti-priority went to the home-building arts.

And through making-do with the industrially-unwanted low-performance materials men solved home-front production problems, and they were proud of how well they had won their way through and were justly happy and entitled to celebrate the kind of ingenuity they had applied in the anti-priorities. For such logical reasons we tend to laud and honour the many ingenious make-do solutions we have applied to home-front problems, quite independent of and out of sight of the alternate solutions we might make with the industrial equation, were its capabilities grown so plenteous as to make universally possible the using of world resources in the most effective kind of manner.

Now I will introduce several more fundamental aspects of the industrial equation. We have seen that because the industrial equation involves the enormous pattern of half-way-round-the-world resource-centralising that by the time we have centralised the resources, the capital expenditure is enormous. In order to justify such enormous long distance anticipatory expenditure, we have to reassociate the centrally dissociated chemical elements in such an effective manner that the temporary products of this activity will be so generally advantageous to world around man as to win an actual commonwealth of physically regenerative, i.e. inherently increasing, advantage of man over nature's *a priori* patternings. Which means the increasing ability to govern the ceaseless evolution of inter-patterning transformations. Therefore, in order to find the largest number of human beings who can be benefited by the newly produced patterns we have to go half way round the world again. By finding the highest possible numbers of users we find means of maximum division of initial costs and sharing of further capital initiations. Therefore we find the industrial equation is inherently involved in underwriting two half-way-round-the-world network ventures. Next we see that the energies that are expended in doing work all around the world are enormous. We therefore begin to see that the ratios of performances per foot pounds of work done by given units of resources invested or expended are vital data to the comprehension and scientifically designed employment of the industrial equation. Therefore in the industrial equation we find that the words for concepts of weight of products are very important to the success of the world-embracing economy that is being developed. In our home front buildings, however, we do not think very much about weight. The engineers who must calculate the buildings in order to implement their architectural designs are forced to analyse and treat with their weights, but weight is not an original consideration of the patron and architect. All we have to say to prove the point is, does anybody know what this building weighs? This is the home building of the Royal Institute of British Architects, and those architects are officially present now. Does anybody here know what this building weighs? I'm sure not. I once asked an American symposium of architects

including Raymond Hood and Frank Lloyd Wright as well as the architects of Rockefeller Center, the Empire State Building and the Chrysler building about what the different buildings they were designing weighed, and it was very clear that weight was not one of their considerations.

So let us then ask questions of almost any audience about the weight of one of our major ships, such as the *Queen Mary*, which is obviously of the magnitude of one of our very large buildings, and we find that these kinds of industrial pattern weights are very familiar to the public. Therefore the concept of weight, the fact that weight considerations are not primary in buildings, tells us how far building is from the industrial equation, lest any think that because we build big buildings and use some industrial materials that industry has therefore embraced the building arts.

Now more in relation to principles governing the industrial equation. One principle is that the tools themselves can be used to make more tools, that is, you can invest the industrial capability exclusively in the regenerative function of greatly enlarging itself. Industry really accomplishes self-lifting by one's own boot-straps. One lathe man can make ten more lathes instead of consumer products, and then ten men go to work making ten more lathes each and each one can be a better lathe than the one before. Thus the whole world's overall tool capability is swiftly regenerated towards comprehensive and plenteous capacity.

Another aspect of the industrial equation is that it gradually discerns the various functions of humans and differentiates those functions out and develops tools which can carry out those functions. We find that industrialisation was always inevitably headed towards automation, that is towards complete disenfranchisement of man as a physical, i.e. as a muscle and reflex, machine. The concepts of Marx are typical of the erroneous and inadequate way in which men at first thought about the industrial equation. They thought of man in a sense chained to the machines and grievously exploited by the machine owners. With automation—an increasing economic reality—we now see that the industrial equation was all the time heading toward elimination altogether of man as a worker. The industrial equation will bring about a condition where within a century the word 'worker' will have no current meaning. It will be something you will have to look up in an early 20th-century dictionary.

How, then, does the industrial equation go on? What is man's relationship to it? The answer is that the larger the number of those served by the industrial equation the more the unit costs are lowered and the more universally its regenerative pattern stimulations become distributed. This is to say that the larger the number of consumers the more successful is the industrial equation. The more the numbers of people served the more regenerative industrialisation becomes. Therefore we discover that industrial equation works towards man having infinite significance in universe as a regenerative consumer. As a fundamental result at our present moment in history men are becoming very swiftly disemployed as physical workers, and on the other hand men are now swelling the ranks of intellectually preoccupied experimentalists in scientific and industrial research and development and are always getting ready for the launching of the next wave of evolutionary transformations. That is, men are increasingly concerned with greater anticipatory design of the use of the world-around network of industrial capabilities. Therefore even unwittingly men are accelerating their capability to render the world's total inventory of resources adequate to the comprehensively advancing needs and growth advantage of all men. I will cite one more pattern governing industrialisation as it comes finally to bear upon the building arts. The kind of patterns that we are reviewing today are obviously patterns that only come into apprehension, comprehension and reviewability through time and increasing inventories of integrated experiences of all men. These are not patterns which were discoverable in advance by men.

In architectural circles we frequently speak of buildings as environment controls, i.e. the local controlling of energetic patternings of the universe manifold high and low frequency events; we have local environment controls on the land which we call buildings; we have environment controls on the sea which we call ships; we have environment controls in the skies which we call airplanes. These are each and all vessels of preferred pattern regeneration.

The environment controls on the land are installed in the crystalline chemical structures' state. Environment controls on the sea are installed in the chemical structures' liquid state and the environment controls of the sky are installed in the chemical structures' gaseous state. In the crystalline state, the amount of energy that is necessary to disturb the chemical structures are enormous. The amount of energy necessary to disturb liquid phase chemical structures is but a small fraction of that necessary to disturbing crystalline structures. The amount of energy necessary to the pattern disturbance of the gaseous phase of chemical structures is but a small fraction of the amount necessary to the disturbance of the liquid phases of chemical structures. Einstein's equation $E = MC^2$ directly governs these relationships. In a universe of energy in which no energy is created nor energy lost, the numbers of times that nature has enough energy concentration to disturb the crystalline state at any one locality in universe are relatively infrequent. The numbers of times universe has energy available locally to disturb the liquid structure states are very much more frequent.

Even more frequently are there enough energies available locally to bring about very large disturbances of the gaseous states. If we then are going to build a structure on the land as a local energetic environment control, the probability of an earthquake at any one point for instance is so low that men for many generations were unaware of it even being a possibility, and they certainly would hope to build in between the earthquakes. The numbers of times floods might occur were much more frequent but they said: well it is worth while because the alluvial plain is so rich that we would rather climb to the high land as the floods occur than go back to the low land when the floods recede. The number of times that there were avalanches and fires were relatively few, so people built upon the crystalline state approximately oblivious to the infrequent challenges of earthquakes, hurricanes, floods, avalanches and so forth. They were more concerned with building bulky inert fortresses which, because of the solidity of the earth, seemed to rest on top of the earth without sinking into it.

On the sea we are immediately faced with flood all the time, and the best thing to do is to stay on top of it. And the minute we try to discover how to stay on top of it we find that stones don't seem to stay on top of it and that wood does seem to stay on top of it. Thus men discovered floatability millenniums and millenniums ago. In dealing by designed actions with controlled environments suitable to the liquid state men are normally faced with this floatability as a basic requirement, but are also faced with very frequent seaquakes, that is we probably have seaquakes every day in which the size of the waves will be greater than those of the earthquake. Therefore we have to design for seaquakes or we won't stay on top of the water. Then every time the great seas come combing over and smashing down on our decks the actual tonnages involved are quite equal to the tonnages of impact of an avalanche. So we have to design for sea avalanches every day. When controlling environment on the liquid state we have also to design for hurricanes because in fact upon the sea we are going to exploit the hurricanes to drive our ships. Therefore in ships we must design directly for structural behaviour super to all these very hostile behaviours of nature specifically regarding the foot-pound energies of nature's limit behaviours and we must experiment until we do learn. Our ships go down until we do learn. And once we have learned how ferocious nature may be, then we ask, is it worth while going into this very unfriendly energetic world of the sea? We discover it is, first because of those resources that occur remotely all around the world and secondly because of the fact that you can float such enormous loads of resources from here to there as to completely outclass the small loads that you can carry on your back or on the backs of animals. Therefore the ships were potentially very worth while, and in order to make the ship realistically very worth while you have to learn how to establish ratios of preferable investment of the total floatability, how much is to be assigned to the cargo and how much is assigned

toward each of the structural capabilities required to meet these enormous stresses, corrosive forces *et al.*

Therefore exquisite ratioing of the performances per pounds per functions became the very essence of shipbuilding design, whereas such ratios were never thought of in respect to building environment controls upon the crystalline structured land. In fact your first great buildings were not only fortresses in which you wanted a lot of weight, which other people could not push around in a hurry, they were at first nature's own caves which you occupied and which you later contrived as local modifications of the solid earth and did not think of as separate buildings.

When we go into the air with man-designed environment controls we come into conditions where just to stay in the air at all there is no floatability, and we have to stay there on sheer intellectual capability. We get out into the sky and stay there by integrating the experience of all men and by faithful consideration of all factors and measurements of the experiences. You cannot stay out there on a myth. First we must start flying at greater than hurricane speed. Hurricane speed is stalling speed, so the hurricane speed becomes minimum normal and in our modern airships we go into six, eight times hurricane velocities as a normal condition of environment control designing.

Due to large-size disturbances of the air by very small amounts of energy, even the sun radiation reflecting from the surface of a small white glistening roof will bring about a spirally rising thermal column of air rising hundreds of feet, sometimes a mile high, into the air. And in a plurality of these great thermals we get enormous air waves which might properly be called airquakes. The airquakes are enormous in size and of such high frequency as to be almost continuous.

When a great air liner moving along at five times hurricane speed runs into one of these great thermals and rises and drops hundreds of feet the physical dimensions and stresses involved are precisely those of taking the *Queen Mary* over Niagara falls at full speed and doing it so capably that the passengers just say it's rather bumpy today!

Now it is very important to realise the magnitude to which man's scientific and technical capability has really advanced. In both the airframe and power plant phases of industry today man has really reached astronomically augmented degrees of new advantage in respect to his ability to swiftly alter his *a priori* physical environment patterning. Faced with the recent news of sputnik's success we were thereby informed of the arrival of the inter-continental missile rocket. With it the airplane which had come into premiership 52 years ago as the longest arm of striking power now was displaced as the number one weapon. For fifty years the aircraft had enjoyed all highest priorities of access to scientific industrial capabilities. So complex and swiftly evolving was the airframe phase of the industrial equation that its underwriting could only be financed by major nations and only under the mandate of omni-survival emergency anticipations. So great have been the nationally subsidised underwritings of the airframe phase of man's acquisition of the industrial equation capabilities that the 52 years of man-piloted aircraft development have involved a total of national expenditures in the range of four trillion American dollars, approximately one hundred fold the value of all the gold in the world. An overall undertaking whose magnitude could only be visible in retrospect and as astronomically invisible to yesterday's private finance capital capabilities as was atomic power to optical foresight.

With the airplane industry rendered suddenly obsolete as the number one long range, highest velocity, highest energy packing and hitting power—the great national subsidy of the aircraft industry automatically relinquishes its half century of popular mandate support as the number one national emergency anticipating defence measure and this obsolescence is simultaneous by all the major industrial initiative-competing nations. The aircraft industry should not be looked upon as one industry amongst a myriad of other independent industries. It should be looked upon as the total industrial equation accredited and operating at the highest level of historically augmented and integrated capability. In the aircraft phase of industry the relative efficiencies of performance realisations as ratioed to invested resources are, for instance, ten fold the efficiency realised when the industrial equation is operating at the automobile manufacturing level of comprehensive policy integrity. Shorn of its half century of vital subsidy—as a child grown to manhood and at full stature of capability is divested of further parental support—the aircraft phase of industry will now have to employ its superior degrees of capability with even greater discretion and comprehensive usefulness than under its bureaucratic governance. With its sudden reorientations first labelled recession, this release of a ten-fold greater capability into the home front undertakings will bring about manifold dislocations of the lower order of efficiency phases of industry—but nowhere will its world-around capabilities be more dramatically applied than to the long time anti-priority area of the comprehensive building arts and to the swift provision of world-around accommodation of the new air-ocean world flown, embracement of whole earth by all men—in their frequency-modulated, therefore approximately invisible, one-town world of 1968 realisation.

In a few moments I am going to go through a number of slides as rapidly as possible. In them I will submit to you a 30-year series of experimentations not only in the direction of ultimate participation of landed environment controlling in the most advanced capabilities of industry, but also in relation to the individual and his functioning, and in relation to the questions of whether and how he can take the initiative in regard to challenges such as those we are reviewing this afternoon. In searching for the functioning capabilities of the individual in the industrial equation evolution I am sure that you will comprehend that I see myself only as a Mr. X—as any typical fairly healthy individual. What impressed me about me in making the experiment with me was that I was so very average. Despite that very pleasing introduction today I can say that whatever results are now capable of inventory, are the result of my basic assumption of average individual capabilities at outset. I knew when I started in 1927 that I could not jump very high and I could not swim very fast and I hadn't earned the best marks in the class, and I was very obviously only average and inasmuch as I was interested in what the average individual could do, I was a very good case for experimentation.

There was one *a priori* requirement to this third-of-a-century experiment, and that was to give it a cleanly controlled opportunity of producing unprejudiced results. I must forsake altogether the idea of priority of the necessity to *earn a living*. When I was very young my two grandmothers both told me about the golden rule, and as a young man of four I thought it was a very excellent rule and I admired the idea. I had a shock later on when I joined the Navy and the other members of the Navy suggested that this might not be the operating rule of the seafaring people. And later there was an uncle who took me aside and said, 'Young man, I am sorry to have to tell you that about a hundred and fifty years ago we had scientific proof that there is not enough to go around. . . . And so it must be you or the other fellow and it must be your family or the other fellow's, really it's very tough, but Malthus and Darwin gave very clear proof of these facts. So I suggest that you learn how to make it yours quickly and incisively and then get around to applying the golden rule as far as is expedient.' Even if you are born into adequate income almost all of us are faced with the idea that we have to earn ourselves a living. I have visited many universities, and certainly the idea seems universal that the boys are preparing themselves first of all to be able to earn a living, and then they hope to be able to earn that living within an area that is interesting to them, and they hope they'll earn a good enough living and obtain early security so they may have time to do the things they would really like to do all the time.

Now in 1927 when our daughter Allegra was born, we had no money, and obviously under those conditions I ought to have gone out to earn a living. But it was just at this moment that the kind of picture that I have been describing to you was tending to loom before me and I didn't see how I could escape doing something about it. I first tried to interest people I thought were much more capable than myself in respect to the looming problem, but I found none who were interested in spending the rest of their years on this problem. It seemed to me from my industrial lag studies that it was a problem that was going

to take a minimum of 25 years to bring into useful scientific treatability. So the question was how could I peel off and forget about earning a living. I did finally peel off from conventional preoccupation with living security, but I did not undertake this research and development as an idealist nor I hope as a crank. My conviction grew out of my discovery of the comprehensive validity and vitality of the industrial equation and the operative principles apparently governing its growth transcendentally to any directed ambitions of men. I was impressed with the fact that in the primarily agricultural and craft eras the individuals in the little towns bartered directly with one another to arrange for their mutual security. One was a shoemaker, the other was growing potatoes and so forth, and each one produced more of his products than he could use personally and exchanged his surpluses with the other fellows. Men then bargained at 180° with the man in front of them. Each made his own deals and organised his comprehensive security all within the visible horizon. However, in the industrial equations, I saw the man standing or sitting at his production station and the nuts and bolts the machine was making at his station were not going off at 180° but were going off sideways at 90° to his line of sight and I saw that it is futile for him to fill his pocket with nuts and bolts to exchange with the hamburger man . . . so I saw that the industrial products tended to go off around the world until the nuts and bolts, for instance, each arrived in their respective logical relationship in larger industrial organisms along with the myriad of other kinds of components, and finally some nuts and bolts would come back to that machine operator but only as an organised technical complex as an automobile or water pump or whatever it might be. His basic security was obtained through the increasing capability of all society thus comprehensively advantaged by the universal tool network.

Therefore it occurred to me that it could also be true in the industrial equation that security need not be a local 180° negotiation but could be an around the world circuit-closing principle. If this were so then also it could be true that if you in your experience actually discerned an industrial gap-closing task that needed your particular experienced attention and no patron of the task could be discovered who was inherently concerned with such tasks, that you might then assume that you were being directly challenged by natural evolutionary process with doing something about that gap, which challenge and response were no more mystical than the spontaneous dodging from under a falling tree. Therefore it occurred to me that it might prove to be economically feasible for the individual to apply himself to such gap-filling functions whose developed solution by him might then go multi-directionally around the world finally to find its right places in the network of integrating capabilities, and thus the wealth advantage of man might be comprehensively increased and the gap-filling individual might find himself surviving by all manner of indirect means as integral functioning of the larger network equations. So it was with the hope of discovering as soon as possible whether that really was true or not that I decided in 1927 to forget for ever the idea that I ought to earn a living. My wife, who is sitting in the front row here this afternoon, really bore the brunt of that decision. But as months then years were passaged safely I watched young men become interested in my kind of research and development advantages and results. The minute you were not concerned with earning a living and really tackled problem after problem that the other fellow is not tackling, there proved to be wealth of solvable problems. In fact I discovered that the whole mass of problems that are worth tackling is so great that I found that any average individual who went into that kind of a paradise wilderness garden ought to make very good progress. If I have made progress that is mildly notable as recited in the introduction today it is only because I walk into that vast, unattended, potential harvest.

Year after year I saw young men become fascinated with those potentials I was dealing with and then they suddenly would say to me 'I'm sorry, but I have to earn a living—I'm different from you, I've got a wife and a daughter. I'm sorry to have to quit you.' Today I am still engaged in this experiment and while I have no right to certify that you or others may be able to survive working upon these same premises, the fact is that my family and I have weathered 31 years, a third of a century in research and development relating directly to the application of the industrial equation to shelter and shelter mechanics and their design, production and distribution.

We cannot say that this survival success is not coincidence, but I personally think it would be extravagant to call it coincidence. I think that the principle of indirect industrial realisation of survival advantage is as well proven by my experience as is the indirect result of general good health as result of an integration of a myriad of individual self-disciplines. I am not afraid to suggest to a young man today that it is possible to forget altogether about the priority concept of earning a living. I had the great honour of sitting beside Dr. Salk not long after his vaccines had been acknowledged in America as providing proven immunity to the vast majority of infantile paralysis exposures. Dr. Salk said 'I've always felt that those dymaxion gadgets, cars, houses, maps, etc., were only incidental to what you really are interested in. Could you tell me what your work is?' and I said 'Yes, I'd been thinking about that definition for a long time. I've been engaged in what I call *comprehensive anticipatory design science*.' And Dr. Salk said 'That's very interesting because that's a description of my work too.'

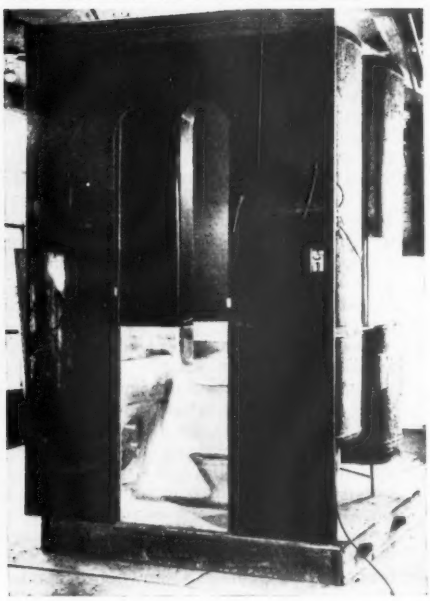
That statement by Dr. Salk fascinated me because I have long felt that whereas medical doctors were at first accredited by society only in an emergency when men were in trouble, and that whereas cures were difficult, doctors long ago discovered the excellent results to be obtained by anticipatory laboratory research that lead to prevention as far more comprehensively effective than cures, and thought that whereas doctors are concerned with the internal organism of man, industrialisation might be thought of very accurately as the external organism of man and that man's external disorders could best be treated not as *local* curative techniques but as comprehensive laboratory search and research leading to universally effective anticipatory prevention of maladies of the industrial organic evolutionary growth by appropriate comprehensive anticipatory design science. I am now going to describe a scene for you. If a doctor ran his office the way an architect runs his office the following would be the picture. We have the anteroom of a doctor's office and on the walls there are pictures of various dramatic operations he's done—in comes Mr. and Mrs. Jones, and they look admiringly at the pictures, finally they are admitted to the doctor's presence and he says 'Well, now, what can I do for you?' And Mr. Jones says, 'Darling, I'll tell him. Doctor, we are going to have Mrs. Jones' kidney removed.' And the doctor says, 'How very interesting. How do you happen to be doing that?' 'Well', Mr. Jones said, 'Mrs. Jones' mother had been telling me about the kidney trouble running in her family for generations, and the obvious thing is to have it removed.' The doctor says, 'Mr. Jones, this is a piece of really brilliant thinking.' And Mr. Jones says, 'We've been very much impressed with your operations, Doctor, and before coming to you we have reserved the room at the hospital and our niece is an anaesthetist, and so we've hired her and my brother-in-law is a hardware dealer so I have rented his tools for you. We find it's going to be quite expensive, and we thought that while my wife is under the anaesthetic that we might as well have a little more work done, for instance Mrs. Jones has never been very pleased with her face, so we thought we'd have an alteration. . . .' And the doctor says, 'I'll have to have some measured drawings made of Mrs. Jones', and he calls for his internes and they make the drawings and they also render studies of how well she's going to feel without her kidney, and a number of schemes for Mrs. Jones' altered face for her selection. Finally the specifications are drawn and the final drawings are completed so they call in three local butchers to bid on the job.

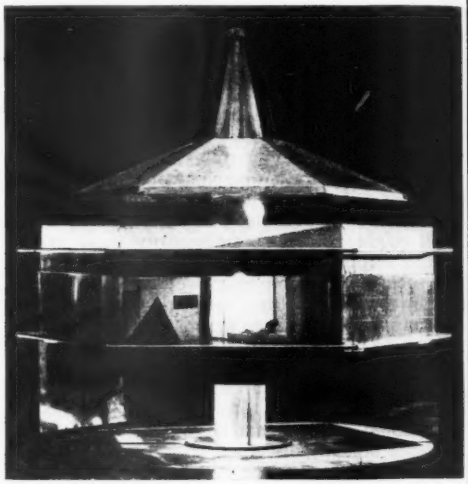
In contrast to that scene comprehensive anticipatory design science assumes that the client knows absolutely nothing about what he needs or what should be done about it. I have brought a little model here with me. We are going to be studying structures in the slides and—there's a word which I would like to introduce into our thinking, and this word in our thinking is going to be the word *synergy*. How many in this audience are familiar with the word synergy? May I have a showing of hands.

There are approximately none in the audience familiar with the word synergy. Now the word *synergy* is as old as the word *energy* and simply the prefix SYN in front of ergy instead of the prefix EN as in energy. By energy we mean the differentiated-out local behaviours of comprehensive universe or nature, for instance as gravity or as optics. By synergy we mean the integrated behaviours of nature, and synergy is said to be '*behaviour of a whole system unpredicted by the behaviour of its components or any sub-assembly of its components*.'

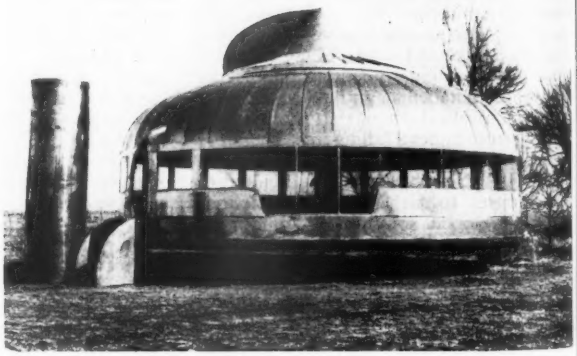
The question is: why do men not know the word synergy—obviously because we do not tend to need the word in our thinking patterns. Behaviours of whole systems unpredicted by behaviours of their parts seems to our accepted logic to be a sort of mystical concept. We tend to think in the terms of our *elementary* strategy of education where we start by dealing with parts and learning how to handle our local parts well. Because of our local elemental focus we then tend to think it is logical to say that 'a chain is no stronger than its weakest link'—which immediately is thrown out of validity when we first join the other end of the chain back on itself and then when we break the weakest link there is still only one piece of chain and we are mildly confounded in our statement. Then we say: well chains are not supposed to be linked together at both ends and the reason we say that is because we inherited the Greek concepts of plane geometry as elementary which later led into *solid* and even later into *spherical*, etc. The exclusively local aspect of plane geometry imposed the concept of an infinite surface and the infinite line as logical to the then prevalent belief that the earth was flat and infinite—ergo all 'straight lines' were open-ended, i.e. infinite, that is why we think then a chain ought to be just an infinite line. However in nature all the lines are completely curved and all chains do eventually return upon themselves. This fact is, for instance, the very essence of metallurgical structuring.

Are there, then, in nature behaviours of whole systems unpredicted by the parts? This is exactly what the chemist has discovered to be true, moreover he discovered that, contrary to his elementary kind of experience at elementary school, that he did not come into the chemical laboratory and find a soda fountain with spigots for hydrogen and oxygen and so forth with which you mix up the universe as you go and thus you began to make the universe work. He found the universe already in complex working order. And every time he partially separated out any of the elements from the others, he always discovered that the behaviours of the localised elements never accounted for the associated behaviour of the *a priori* complexes. So the chemist is thoroughly familiar with the word *synergy* which is the only word in the dictionary for this omnioperative behaviour of universe. Synergy is the essence of those great changes of man in respect to his *a priori* environment which I have described today. The essence of evolutionary realisation of our jet airship is the chrome nickel steel by virtue of which the enormous concentrational energies could be released as heat which would have destroyed engines of any pre-chrome nickel steel production. Because of the high strength of chrome nickel steel even under conditions of enormously high heat it prevents the destruction of the structural design integrity of the jet engine which would then translate its thrust to the ship. And chrome nickel steel is very typical of synergy. We will take the predominant constituents of chrome nickel steel, the primary element components, iron, nickel and chromium, and we will take their tensile strengths per square inch of cross section—as their primary criteria of relative strength, and we will take the 'commercially pure'—which is only partially pure—samples of the chrome, nickel and iron which are the strongest elements in chrome nickel steel. There are of course

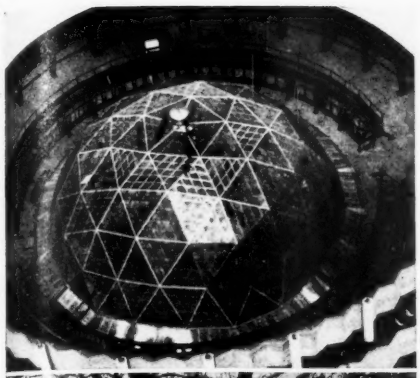


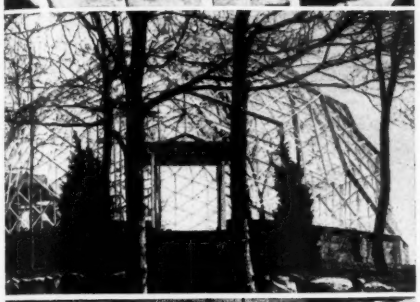


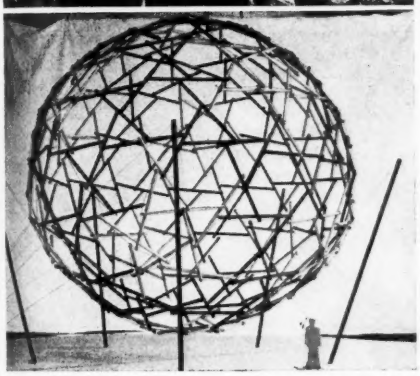
Top left: 1932: Dymaxion four-dimensional 11-passenger Transport No. 3, weight 300 lb. per passenger. Bottom left: 1930: Dymaxion bathroom, weight 420 lb. Top right: 1927: Dymaxion 4-D house (model), weight 6,000 lb. Bottom right: 1945: Fuller House, weight 6,000 lb., with packing container



(photo: McCormick, Armstrong)







Above: U.S. Marine Corps helicopter transporting own hangar, 1954 (*photo: U.S. Department of Defence*)

Top left: 93 ft. span geodesic dome, weight, 17,000 lb. Ford Motor Company Rotunda Building, Dearborn, 1952

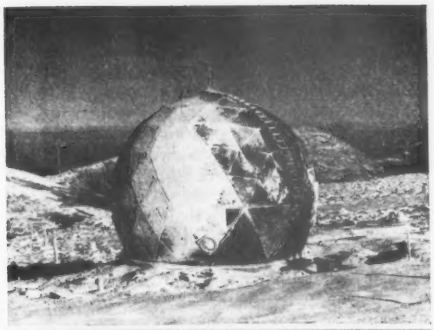
Centre left: 54 ft. span geodesic dome, 6,000 lb. Wood's Hole, Mass., 1953 (*photo: R. B. F.*)

Bottom left: 270-strut liniature tension integrity sphere, U. of Minnesota, 1953 (*photo: R. B. F.*)

Top right: 31 ft. three-quarter geodesic sphere, 3,000 lb., on summit of Mount Washington, New Hampshire. It withstood unharmed officially recorded 182 m.p.h. winds

Centre right: 100 ft. span dome at Kabul, 1956

Bottom right: 145 ft. span, Kaiser-erected dome in aluminium, Honolulu. Auditorium seats 2,000 people



other elements, carbon and manganese, etc. Taken individually the chrome, nickel and iron square inch sectional capabilities are in the approximate range of 60,000, 70,000 and 50,000 p.s.i. tensile strength. In association, chrome nickel steel is a pattern, a constellation of behaviours dictated by nature, not by man, and as a chrome nickel steel casting we will often realise 300,000 p.s.i. tensile strength, which is then six times as strong as its weakest elemental link and four times as strong as its strongest link. Is this a mystical behaviour or can we account for it? We discover of course that we can account for it in a logical manner. We knew, regarding organics in the previous century, that all the organic structures were tetrahedronally configured. Since 1933 we have also learned that all our inorganic structures are tetrahedronally configured.

At this point Mr. Buckminster Fuller demonstrated a model and then showed his slides.

Tension Integrity Mast: discontinuous compression—continuous tension, 1948

I have shown you a very small scattering of the kinds of structures that we experimented in, and we have found by and large that they are averaging anywhere between one-thirtieth and one-thousandth the weight per volume ratio of conventional buildings, and yet all of them are designed for the highest capability in respect to the environmental challenges and our design for air flyaway delivery half way around the world.

Therefore we do see that it is actually within the visibility of the industrial equation that as men begin to really employ their resources by comprehensive anticipatory design that they may be able to actually make our total resources, which are now serving only one-third of humanity, serve all humanity. We could very well up the performance per pound in such a manner that in relation to the living problems of man the total resources might become quite adequate, because in doing so we would only have to up the overall

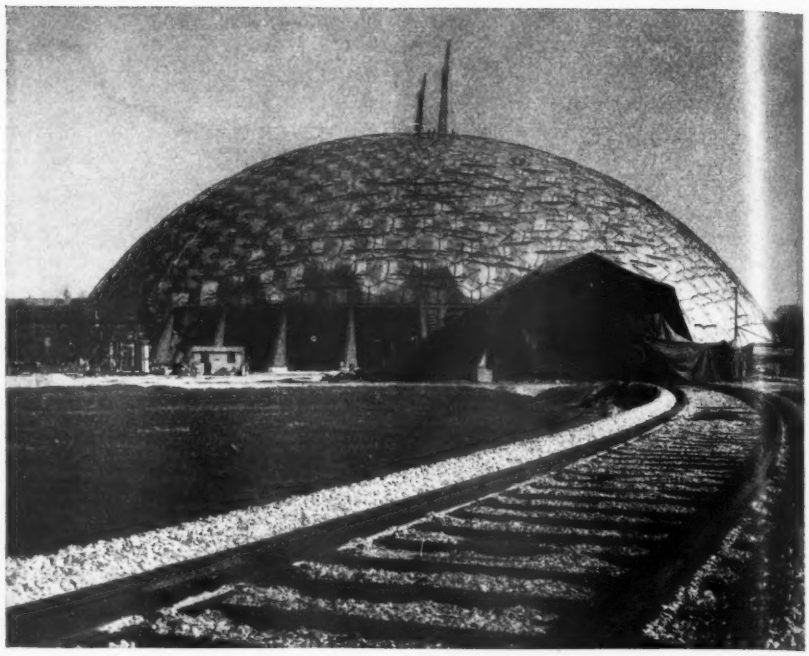
mechanical efficiency of our total industrial machinery in the world, which is now about 4 per cent efficiency; it would only have to be brought up to an overall of twelve in order to make there sources which are now serving only one-third of humanity actually capable of serving all humanity.

I have actually trespassed on my time, because you can see that I feel that there really is discernible an entirely new kind of a challenge, particularly the challenge to man as designer. Politically we are greatly frustrated and increasingly frustrated around the world. In the terms of the great challenge which is how to make the whole earth enjoyable by all men, we see this can only be accomplished by design competence, and it is design competence which must be developed in the laboratory by associated research, using our great universities. There, the architect, instead of being accessory after the fact of the great wealth-making of yesterday's era of commerce, joins together with the other architects in taking the economic initiative, joining together with his university, really exploring for the highest capability of man. The architects may thus be able to bring about this great change-over to man comprehensively successful on EARTH. Instead of reform and revolution, it looks to me like new form and evolution.

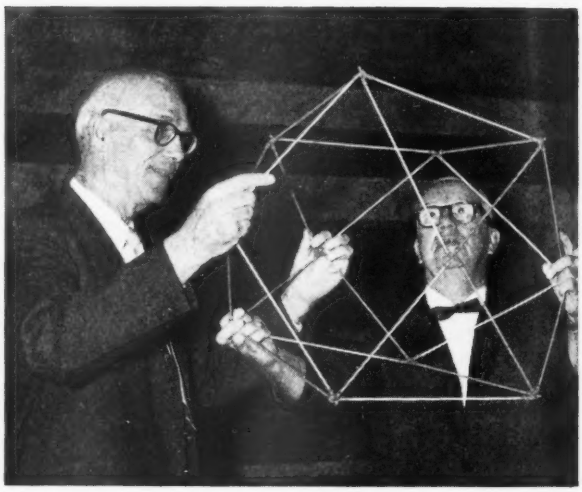
THE VOTE OF THANKS

Mr. Ove Arup: It is a great honour to have been asked to move a vote of thanks to Mr. Buckminster Fuller. I am afraid that I am a little at a loss what to say. I have only this in common with him—I, too, am speaking without notes. I did not know what he would speak about, I have had only two days and many other things to think about, and it is obvious that it would have been better had he used my time, too! He could then have continued with his lecture, because we are nowhere near the end; we have not heard nearly enough. That is the only complaint I have to make.

It has been a most inspiring talk, and the pictures have shown enormous achievements in construction by new methods. To produce these shelters in the Arctic and elsewhere is obviously useful, but he is not satisfied with doing these things; he must also philosophise about them and produce a theory. It would have been interesting to have heard much more of his work and his underlying philosophy, and to have time to study it and see how it all hangs together. I do not know how useful his philosophy is, although I agree that one should philosophise. But there are many things which I have not understood. We all agree with his general world picture, but I should like to have more details about his interesting proposition that one should find out where there are gaps to be filled and proceed with gap-filling without bothering about earning a living. I wonder how that can be reconciled with the time-lag of which he spoke between the invention and its utilisation in the building industry, because if one had to wait 25 years for the result one might be pretty hungry by that time.



Union Dome for Union Tank Car Company, Baton Rouge, Louisiana, 1958. Internal diam.: 384 ft., height: 116 ft. at centre. Material $\frac{1}{8}$ in. steel sheet panel, 4 in. steel tubing



Mr. Ove Arup examining the model used by Mr. Buckminster Fuller in his demonstration. This model demonstrates typical synergetic behaviour. It demonstrates many unpredicted total configuration evolutions

I should have liked to hear more of the geometric properties of the sphere. Like other engineers, I have in my time been interested in how one could divide space by rays from one point which were all equidistant. You can do it with a circle in a plane and have radii of any number equidistant all round, but if you try to do it in space it turns out to be impossible. You can do it only in certain figures.

Mr. Buckminster Fuller has certainly thought about spheres and their subdivision and knows more about the problem than anyone else. He knows all the ways of covering a sphere with triangles and various patterns, and it would have been interesting to hear a little more about it in detail. In the pictures we had a tantalising glimpse of the various things which have been done.

It would have been interesting to learn much more, but it is of course asking for the impossible to have a lifetime of experience explained in one or two hours. We must be satisfied with having obtained this glimpse of this most interesting activity and this most interesting personality. There is no doubt that he is a personality; he is genuine. I believe that he is giving some other talks, and I think we should like to go to them all.

I have great pleasure in proposing a vote of thanks to him. We are very grateful to him; we could have listened to him for another two hours with the greatest of ease.

Practice Notes

Edited by Charles Woodward [*A*]

LAW CASE

Disclosure of the amounts of tenders. Frederick Leslie Hasker and Ruthven Oliphant Hall (practising as Hasker and Hall, a firm) v. Eric T. Johnson. *Extracts from the judgment of Mr. Justice Slade given on* 26 *June* 1958.

MR. JUSTICE SLADE: The plaintiffs in this case, Frederick Leslie Hasker and Ruthven Oliphant Hall, practise in co-partnership as Hasker and Hall. The partner who comes solely into this matter is Mr. Hall who is a Fellow of the R.I.B.A. The defendant, Mr. Johnson, was the owner of an hotel, I think at Moor Hall, Ninfield, in Sussex.

In the year 1955, Mr. Johnson was minded to build himself a house in the grounds of his hotel and he enlisted the professional services of Mr. Hall, or Mr. Hall's firm, as his architects. Mr. Hall, acting in accordance with his instructions, prepared a site plan for the proposed house and made an application to the appropriate authority for planning permission. On 17 August 1955, the outline planning permission was received, whereupon Mr. Johnson instructed him to prepare the necessary sketch plans.

Mr. Johnson handed to Mr. Hall a list of builders, which included amongst others the name of Messrs. S. A. Webb and Sons, as builders whom the plaintiff, Mr. Hall, should invite to tender for the execution of the work. I think five builders were in fact invited to tender; one did not tender and four did. The lowest tender was that of Messrs. S. A. Webb and Sons (the firm to whom I have already referred and whom I shall call 'Webbs') and was for £6,305 10*s*. The next lowest was Messrs. C. Philcox and Sons for £7,463, slightly more than £1,150 more than Webbs. The next lowest was the Lewes Building Works for £8,221, and the highest was Messrs. C. S. Bristow for £8,815.

Before dealing with a conversation which took place between Mr. Hall's assistant, Mr. Simpson and Mr. Webb on 25 August, I will deal finally with the question of the form the contract was to take. The specification appears on page 26 of the correspondence and under the heading 'Preliminaries' paragraph 3 says: 'Form of Contract. The Form of Contract will be that issued by the Royal Institute of British Architects, dated 1939 (revised 1952), in which quantities do not form part of the contract.' Paragraph 7 says: 'Time for Completion. The contractor is to state in his tender the length of time he will require to complete the works included in the contract.' Paragraph 8 says: 'Damages for Non-completion. If the contractor fails to complete the works within the date mentioned in the contract or within any extended time fixed under clause 18 of the R.I.B.A. contract, the architect will certify in writing that the same ought to have been completed and the contractor shall pay a sum calculated at the rate mentioned in the appendix of the contract as liquidated and ascertained damages for the period that the works remain incomplete.' It was upon the basis of the specification containing preliminaries in those terms that the estimate of Webbs and the other estimates were sent. It is, of course, obvious that there could have been no concluded contract in the R.I.B.A. form of 1939 (as revised 1952) until the time for completion had been agreed between the parties to the proposed contract and inserted in clause 17, and until the weekly penalty for liquidated and ascertained damages for non-completion within the prescribed time, subject to any extension allowed by the architect in accordance with the form of contract, had been agreed. It being common ground that at no time throughout these negotiations was the time of completion ever agreed (and, of course, until the time for completion was agreed the penalty clause could not come into operation, because obviously, it only could come into operation from the expiration of the time of completion), and it follows from that, that there could never have been a concluded contract between the parties, *a fortiori* it follows that the estimate sent by Webbs on page 43 of the correspondence was not in law an offer which was capable of being turned into a contract by simple unconditional acceptance.

Mr. Hall told me that upon noticing the amount of Webbs' tender in relation to the amounts of the other three tenders he was rather perturbed at their exceptionally low figure. There was ample justification for Mr. Hall's perturbation in that respect. I was told that the profit which a builder may normally expect to get was 5 per cent to 10 per cent. If one takes the highest percentage of 10, the application of arithmetic shows that on the highest figure there would be a profit of £881; on the lowest but one figure there would be a profit of £746; and yet the lowest figure is no less than £1,150 lower than the next lowest. Therefore, upon the basis of 10 per cent, it would appear at first sight that such a tender could only amount to a loss. I was reminded, quite rightly, that there were such things as complimentary tenders, which I understand to mean that people who are invited to tender, rather than create the impression that they are reluctant to do so or that they do not welcome the opportunity of tendering, put in what are called 'complimentary tenders', that is to say, tenders at such a high figure that they know there is no chance of their being accepted. At the same time, they earn the goodwill of their invitors by saying: 'Well, at any rate, we have taken the trouble to accept your invitation.' That, of course, is a possibility. It is sufficient for me to say that there was ample justification for Mr. Hall's perturbation.

Having felt that perturbation, as he told me, he instructed Mr. Simpson, his assistant, to telephone Mr. Webb of S. A. Webb and Sons. The instructions which he gave Mr. Simpson were to tell them that their tender was the lowest; to ask whether they were prepared to enter into a contract at that figure, and to ask them if they would care to check their figures before saying that they were. Mr. Simpson immediately carried out Mr. Hall's instructions. He told Mr. Webb on the telephone that his employers had received all the tenders and that his was the lowest. He asked Mr. Webb whether he was prepared to enter into a formal contract at his tender figure after he, Mr. Webb, had checked his costs. Mr. Webb at once said that he was prepared to do so, and that he did not wish to check his estimate. Not content with that, Mr. Simpson pursued the point with Mr. Webb, and Mr. Webb again said that he did not want to check his figures as he had trust in his estimator, who was a man who was not liable to make mistakes. What a happy man! I wish I could say the same about myself! Mr. Simpson reported the substance of that conversation to Mr. Hall. I pause there to point out what really is the difference between saying to a man who is proposing to enter into a contract at a certain figure 'Yours is the lowest of the estimates we have received, and we have now received them all. I am taking the trouble to ring you up to tell you that fact and to offer you an opportunity of checking your figures before answering my inquiry as to whether you are really prepared to enter into a binding contract at that figure', on the one hand, and saying: 'The difference in price between your figure and the next lowest is £1,150 odd.' I suggested at one time that a nod was as good as a wink to a blind horse, and I cannot help thinking that had the average person been given the information that Mr. Webb was given on the telephone he would have been told in so many words not that his figure was X pounds Y shillings and Z pence lower, but that it was sufficiently lower than the next lowest tender to make it desirable from his own point of view to check his figures. Really the only difference that I can see for the purposes of this case is that if he were dealing with a dishonest man it would give the dishonest man an opportunity of saying: 'No; I have made a mistake, and I will now only enter into a contract for my estimated figure plus X pounds.' He would not know precisely how far 'X' might go, that is to say, the precise difference between the next lowest tender and his own tender. At any rate, that is what happened. I think it is fair to assume that one thing must have been present to Mr. Hall's mind when Mr. Simpson told him of the outcome of his conversation with Webb, and that is: 'Here is a man who has been given every opportunity of checking his figure and who is so content with it that he will not even trouble his estimator to investigate the difference. He says that he is prepared to enter into a contract at that figure.' That becomes not unimportant when I come to what is the real subject-matter of the complaint against Mr. Hall in this case.

Immediately after that telephone conversation, Mr. Hall wrote to his client as follows: 'Messrs. Webb's tender is so much lower than the others that I have thought it necessary to obtain their confirmation that they are ready to enter into a formal contract at that figure: they have given this confirmation on the telephone this morning. They say they can start the work immediately and complete within about six months, though they wish to consider further the time for completion before confirming. The result of the tenders and our subsequent inquiries therefore indicates that Messrs. Webb are able to carry out the work at a reasonable cost and within a reasonable time.' The reply to that letter was in substance an expression of willingness on the part of Mr. Johnson to accept the estimate of Webbs at the figure of £6,305 10*s*., although at the outset he had hoped to limit his liability to £6,000. I am satisfied that he would have accepted the estimate of £6,305 10*s*, but it is to be noted that at no time does he criticise Mr. Hall for having given the opportunity, which I have already mentioned, to Mr. Webb of resiling from his estimate figure, nor indeed in this action is any complaint made of that conduct on the part of Mr. Hall.

Thereupon Mr. Hall wrote to Webbs accepting their tender of £6,305 10*s*., 'on condition that your references which we discussed with you on the telephone are in order'. In that letter Mr. Hall enclosed a list of the other tenders which had been submitted.

Mr. Hall then wrote to Webbs requesting them to give him a date for completion of the works. In September 1955 Mr. Hall rang up Mr. Webb on the telephone. At that time a meeting had been arranged on the site at which there were to be present Mr. Johnson and his wife, Mr. Hall and Mr. Webb. Mr. Webb told Mr. Hall in the course of that telephone conversation that he had made a mistake in his tender and must withdraw it. Mr. Hall asked him how the mistake arose, and told Mr. Webb that as he knew that they were due to meet on the site he must produce evidence of his mistake. He told Mr. Hall on the telephone that there were two mistakes. The first mistake was that on a matter of percentage addition his estimator had subtracted £250 instead of adding it, making, of course, a difference of £500, and the second mistake was that his estimator had made an underestimate of £173 on the drains. These were mistakes to the disadvantage of Mr. Webb, and he therefore intimated that his estimate was too low by the sum of those two amounts, namely, £673.

Mr. Webb brought no evidence dealing with the error to the meeting on the site. Mr. Hall told me that Mr. Webb was quite adamant that he would not sign the contract at the tender figure; he would only sign the contract at that figure plus £673, or he offered to waive the £173 and to sign the contract at a figure of only £500 instead of £673 in excess of the original estimate if the building owner, Mr. Johnson, would waive the penalty clause.

The defendant then wrote to Mr. Hall that 'in view of all that has taken place, I think it best to abandon the project, for the time being'.

Mr. Hall wrote back and said, in substance, 'Well, it is a matter for you to decide, but I think it only fair to tell you that if you abandon the project you will have incurred a liability for my fees and they will be upon the basis of the R.I.B.A. Scale for abandoned work'. Subject to liability in this action, it has now been agreed that the professional fees properly earned by Mr. Hall's firm for the work he had done was the sum of £300.

It now becomes necessary to investigate what is alleged to be the duty of an architect, upon which the whole of those allegations of the breaches of duty in the Defence and Counterclaim are based. Before turning to the law with regard to what is the duty of an agent who is a professional man like an architect, I am going to deal shortly with the evidence. In addition to the oral evidence given by the plaintiff himself, who is, as I have said, a Fellow of the Royal Institute, evidence was given on behalf of the plaintiff by Mr. Duncan Scott, who is also a Fellow of the Royal Institute, and, I think, a member of the Practice Committee. Evidence was also given by Mr. Woodward, who is an Associate of the Royal Institute and is one of the Joint Honorary Secretaries of the Practice Committee. Evidence was given on behalf of Mr. Johnson by Mr. Lloyd, who is also a Fellow of the Royal Institute. Between them they ought to know what is the practice of the Royal Institute. Of course, there are other bodies, but it is the foremost and recognized body of the architectural profession. I am satisfied beyond a shadow of doubt by the evidence which has been given in this case that at one time it was a common practice for tenders to be opened in the presence of the tendering contractors. The practice, as I understand it, was for the tenders to be delivered to the architects as, of course, the agents for the building owner; for the architects to invite the tendering contractors to be present when the time came for them to be opened; for the architects to open the tenders in the presence of the contractors, and to read out not only the name of the tenderer but the amount of each tender, so that at that moment every contractor who cared to take the trouble to accept the invitation to attend heard immediately, and obviously before any contract was entered into, the amount of every other tender. There would be nothing that could be done about it, so far as I know, in law, assuming that the estimate was an offer which was capable of being turned into a contract by immediate acceptance, if, as the architect finished the last word, the man who found that he was the lowest tenderer got up and said 'I withdraw my tender'. The only thing which is uncertain upon the evidence is as to whether the building owner, that is to say, the architect's client, was present when that practice was adopted. I think one of the witnesses told me that he was usually present, but I am quite satisfied that he was not always present and that there was no requirement that he should be present, and it would be quite wrong for me to regard that practice, which obtained over a long period of time, as being justified only when the building owner was present, his presence amounting to a tacit acceptance of what would otherwise have been a breach of duty.

In the R.I.B.A. JOURNAL for 5 December 1936, which is the organ of the Royal Institute, there appears this: 'The Joint Committee of London Architects and Builders have considered a suggestion that the old practice of opening tenders in the presence of the tenderers should be revived as the information so disclosed would be extremely useful to estimators and the knowledge gained by the contractors as to whether or not they were likely to secure the contract would be of considerable assistance to them. The Council'—that means the Council of the Royal Institute; the governing body of the profession—'on the recommendations of the architect-members of the Joint Committee and the Practice Standing Committee, recommend'—I emphasise the word 'recommend'; and in fairness to Mr. Johnson's case I would point out that it is not 'direct'—'members in cases where it is not possible to open the tenders in the presence of the tenderers, to supply to the builders a list of the tenders as soon as possible after their receipt'.

I now come to deal as shortly as I can with the law. Before I can ask myself whether there was a breach of duty by the architect in this case I have to ask myself what in law is the duty of an architect. I will refer in the first place to Halsbury's *Laws of England*, Third Edition, Volume 1, page 183, paragraphs 427 and 428. Paragraph 427 says that if a principal instructs his agent expressly as to how the contract is to be carried out the agent must carry it out in that way or fail to do so at his peril. That, of course, is not this case; there were no express instructions of that kind.

Paragraph 428 says: 'Where he is a professional agent, he must follow the ordinary course of business, and any special usages applicable to the particular case.'

Paragraph 434, page 186, says: 'In the negotiation of a contract the agent must take all reasonable precautions that may be requisite for the protection of his principal. Any contract made by him must be in accordance with his instructions or with usage, and must truly represent the agreement of the parties. Its form must be such that it is capable of being enforced by the principal. If the contract be once completed, the agent cannot rescind it nor vary its terms unless he is expressly authorised to do so. The agent must not be guilty of unreasonable delay in carrying out his instructions, or in communicating to his principal any material information.'

Paragraph 393 says: 'An agent also has implied authority to act in accordance with

the customs and usages of the place where, or the business in respect of which, his express authority permits him to act, subject to the condition that such customs and usages must not be unreasonable, nor change the essential nature of the contract of agency. Provided the custom or usage is reasonable, the agent's implied authority to act in accordance therewith is not affected by the fact that the principal may have been unaware of its existence; and the agent is entitled to indemnity from his principal against losses caused by acting in accordance therewith. What is a reasonable custom or usage is a question of law. It must be a generally recognised custom or usage, and not merely a course of business between the agent and the third party.'

In Bowstead on Agency, 1951, Article 39 at page 56 reads: 'Every agent who is authorised to do any act in the course of his trade, profession, or business as an agent, has implied authority to do whatever is usually incidental, in the ordinary course of such trade, profession, or business, to the execution of his express authority, but not to do anything which is unusual in such trade, profession, or business, or which is neither necessary for nor incidental to the execution of his express authority.'

Article 40 at page 58 reads: 'Every agent has implied authority to act, in the execution of his express authority, according to the usage and customs of the particular place, market, or business in which he is employed.'

Article 44 at page 75 reads: 'It is the duty of every agent strictly to pursue the terms of his authority and obey the lawful instructions of his principal; and, in the absence of express instructions, to act according to any lawful and reasonable usage applicable to the matter in hand, or where there is no special usage, and in all matters left to his discretion, to act in good faith, to the best of his judgment, and solely for the benefit of the principal.' With great trepidation I would suggest, and I would myself prefer, instead of the words 'solely for the benefit of the principal', the words 'to avoid doing anything which he can reasonably foresee may be detrimental to the principal'.

It was submitted to me that the proper way for me to approach the problem that I have to decide, namely, aye or no was there a breach of duty by Mr. Hall in this case, was, in the first place, to look at it quite apart from any custom, usage or practice, in other words, to treat him, I understand, just as though he was an agent and was not an architect. I find it difficult to divorce the question from the fact that he is an architect, although I am quite prepared to divorce it from the question of any custom or usage, if custom or usage is something more difficult of proof than what I may call the recognised practice of a profession. I should have thought it was far more difficult to prove that a thousand rabbits meant 1,100 rabbits or that a baker's dozen meant 13 than to prove the normal practice of the architectural profession, the surveying profession or either branch of the legal profession. It was said that the question I should ask myself was: Apart from any custom or usage, would the disclosure complained of in this action have constituted a breach of the architect's duty to the client as his agent? Was the disclosure one which the architect might reasonably have thought was for his principal's benefit?

The gravamen of the defendant's complaint is this: 'Here were you, Mr. Hall, who, when you had learned of the disparity between the lowest and next lowest tenders, had discharged any ethical requirement of the profession by instructing your assistant to warn Mr. Webb in the clearest possible terms of the possibility of having made a mistake. Having done that and having been met with the answer "My estimator does not make mistakes", how could you have thought that it could be otherwise than detrimental to your client to say to a man who might turn out to be unscrupulous and dishonest, "Well, so far I have merely given you a vague hint not only that you are the lowest tenderer but that you are substantially lower than the next lowest one; I am now going to tell you the precise figure of the next lowest one so that by subtracting yours from that you will see that there is a difference of no less than £1,150 odd in figures around the £6,000 and £7,000 mark"?'

I think the answer to that is this. Firstly, I do not think Mr. Hall could or should have foreseen that Mr. Webb would do as he did. He had, on 25 August, given to him (as I find) information which would have conveyed to any man that not only was his the lowest tender but that he was so substantially lower than the next lowest that he had better check his figures to see if some error had not crept in. Secondly, he had received an assurance that there was no error. Thirdly, in sending the figures, he was carrying out (as I am satisfied) the recognised practice of the architectural profession and acting in accordance with the recommendation set out in the R.I.B.A. JOURNAL of 5 December 1936, and, indeed, he was doing it at a later stage than was suggested by the words 'as soon as possible' which appear in that recommendation. I think that if it is right to follow the recommendation of the Royal Institute, the defendant is forced into this position, that if Mr. Hall had told Mr. Webb the amount of the other tenders either by opening them in the presence of the contractors or when he instructed Mr. Simpson to get in touch with him on 25 August or, indeed, at any time earlier than the time at which he in fact did so, or, at any rate, earlier than 25 August, when, as I say, he gave the information which substantially conveyed the financial position, he would have been doing nothing wrong. But merely because he emphasised the disparity in the figures by giving the exact difference as opposed to indicating in the clearest possible terms that the disparity was a substantial one at a later stage than he might properly have done in accordance with the recommendation of an earlier stage, he has committed a breach of contract in the form of a breach of duty to his client.

Applying the test which I am invited to apply, I find as a fact (so far as it is a question of fact) and as a question of law (which I really think it is when the facts are not in dispute as they are not here) that Mr. Hall committed no breach of his duty to his client when he revealed to Mr. Webb on 6 September of 1955 the amounts tendered by the unsuccessful tenderers. If I am wrong about that in the sense that the onus lies upon Mr. Hall to show something more than a mere recommendation or practice in the profession to do what he did and he has to discharge the burden of proving that practice amounts to a usage, that is to say, a recognised custom or usage of the architectural profession, I find as a fact upon the evidence before me that Mr. Hall has discharged that burden of proof. I think it is a perfectly proper and reasonable custom to disclose to the unsuccessful tenderers so that they may, as I have said, reconsider their commitments, allocate their plant, and deal with their staff, and so on and so forth, and I think it is an equally reasonable usage or custom to disclose to the successful tenderer so that he may consider whether he had made a mistake.

I agree with the evidence given by Mr. Duncan Scott that outwardly, in the case of the disclosure to the successful tenderer of the amounts of the unsuccessful tenderers' tenders, you may incur the risk that an unscrupulous tenderer will increase his tender, not because he has made a mistake (though he may pretend that he has) but for the purpose of lifting his estimate to an amount much higher than it was but substantially lower than the next lowest so that it would still pay the building owner to accept his increased tender rather than the next lowest one.

In the result, therefore, I find as a fact, as I have said, that there was no breach by Mr. Hall either of the duty alleged in paragraph 2(*a*) of the Amended Defence and Counterclaim, or of the alternative duty in the light of the admitted and proved facts pleaded in paragraph 2(*b*) of the Defence and Counterclaim. In the result, therefore, the defence to this action fails, and it is unnecessary for me to consider the by no means easy question which would have arisen had I found that there was a breach of duty upon the part of the plaintiffs, namely, whether that breach of duty led to the builder, Webb, resiling from his estimate.

In the result, therefore, the quantum being not in dispute, there will be judgment for the plaintiff on the claim for the sum of £300 with costs and there will be judgment for the plaintiff on the counterclaim with costs.

Correspondence

ARCHITECT AND ENGINEER

Copy of a letter to the Editor of the Proceedings of the Institution of Civil Engineers in reply to that from Mr. E. D. Jefferiss Mathews in the September JOURNAL.

Sir,—The relationship and collaboration between architect and engineer has been discussed at hundreds of meetings and in hundreds of technical papers without getting us very far, except to establish that nowadays such collaboration is necessary and should begin at the early stages of the job, and that this requires for its success that the architect and engineer should have sympathy and understanding for each other's point of view.

I quite agree with Mr. Mathews that such an understanding could and should be strengthened by a measure of 'co-education' of architects and engineers, but the best education is perhaps obtained by the experience of working together on a job.

If we want to progress from here to find the answers to Mr. Mathews' questions about organisation of the design team, then we will find the going very sticky indeed, simply because the problem is so complex that it is impossible to generalise.

Think of the difference in kind and character between structures designed by architects and engineers, singly or in unison, ranging from water-reservoirs to war memorials, from factories to cathedrals.

The great Italian engineer, Luigi Nervi, very strongly maintains that the engineer must be an architect and contractor at the same time, and that only thus is great architecture created. But would his kind of organisation be the best one to tackle the design of a hospital? There would seem to be no particular advantage in stipulating that the architect of a large hospital who is fully absorbed in satisfying the expectations of his many medical clients should also be the structural engineer and the contractor for the job. One could of course organise building activity vertically, so to speak, by creating organisations dealing completely with one kind of job only—but a little thought will soon convince one that even if this would work in some cases, it could not be elevated to a general principle, except for such parts of buildings as equipment, services and standardised units. There is in fact a need for all kinds of groupings, according to the circumstances.

If we are interested in creating the right conditions for the emergence of great architecture we must also face the fact that creative work is a labour of love by individuals, and is not necessarily produced by rigid and rational organisation. We talk about architects and engineers as if they were all the same, whereas in fact what matters is that the leadership and important work goes to people of the necessary quality, and it matters less whether they are primarily architects or engineers—in fact the leader of a design team must be a bit of both.

As Mr. Mathews rightly points out, the conception and development of any design should come from a single master mind. This leader of the design team will nowadays not be able to evolve all the details of the job himself, or with his own staff, he must rely on allied technicians to advise him, but he must through experience learn to understand at least the principles and possibilities of their work so that he can guide them into the channels which will produce unity and harmony. He should therefore be free to choose his collaborators, because the personal relationship is so important for a happy collaboration.

This leads again to a discussion of the organisation of the design team, and it is of course important to discuss it, in spite of the complexity of the problem, for whereas organisation cannot by itself create good work, it can kill good work.

But such a discussion—unless it is confined to the psychology of collaboration between two individuals—must be broadened to include the whole process of building in our modern climate of technology from the conception of the scheme to its realisation.

We are not dealing with the architect's or the engineer's point of view. There should be no such thing, only a client's point of view, taking the word client in the widest sense as including both the users of the building and the general public in this and future generations, who will be forced to look at it.

The client's point of view should reflect the purpose of the building, and what we are discussing is how we can ensure that the client gets the best possible building for this purpose and for the available means.

The part played by the client should certainly be brought into the discussion; it is his prerogative to make decisions on policy, he also makes the fateful decision of choosing his technical advisers. These initial steps often determine the quality of the work for good or, alas so often, for bad.

The contractor's role, too, should come into the discussion, because methods of construction may determine design—may even in cases be the most important factor.

Is the value of competition in tendering worth the resultant divorce between builder and designer? Is competition in design not equally important, and how can we organise that?

There are certainly enough questions to tackle, and although I am painfully aware that I may have confused the issue by widening the scope of the discussion, my excuse is that it is only by facing these wider issues that we can hope to make progress.

OVE ARUP

'A' SERIES

The Editor, R.I.B.A. Journal

Dear Sir,—I was most interested in the article on standard paper sizes in the May JOURNAL. As I was setting up an office shortly after that I decided to adopt the standards. I thought you might be interested to see how this has worked out.

Of course there are difficulties. The printer's costs were much higher as everything, even the envelopes had to be made specially. The sizes do not tie up with the R.I.B.A. Form of Contract or local authorities' application forms. There is trouble too with drawing paper and photoprints which are charged in multiples of 11×15. However, I think it is a very worth-while experiment and I hope it catches on.

Yours faithfully,

B. HENDERSON-GRAY [*A*]

MANCHESTER BUILDING FORUM

Dear Sir,—The Manchester Society of Architects, the Manchester, Salford and District Building Trades Employers' Association and the Lancashire and Cheshire Chartered Quantity Surveyors (Royal Institution of Chartered Surveyors) have jointly formed the Manchester Building Forum.

The object is to make it possible for all sides of the building industry to examine and discuss jointly mutual problems in the management of building projects.

It is a non-political, non-executive organisation, as such matters can be adequately dealt with by existing Joint Consultative Committees.

Primarily, an Annual Forum will be held as a residential week-end, where national and local speakers will be invited to read papers on a mutually interesting subject.

It is hoped that people of junior executive level of their particular sections of the building industry as well as the older and more experienced members will participate, putting forward their points of view in an open and free assembly where these views would be subject to the experience and examination of all sides.

Yours faithfully,

HAYDN W. SMITH [*A*],

P.R.O., Manchester Building Forum.

THE PROBLEM OF TECHNICAL INFORMATION

Dear Sir,—Your report on Eric Bird's paper on 'The Problem of Technical Information' in the August issue of the JOURNAL was read with keen interest by members of the Architectural Institute of British Columbia. In particular we noted the remark of Mr. Dargan Bullivant 'It is interesting to reflect whether it should not be possible for us to undertake in some small way the role of an institute acting as a collecting centre'.

That is exactly what is now being done by the architectural profession in British Columbia. A separate legal entity has been set up—a non-profit association entitled 'Architects Materials Centre Association'—and known familiarly as 'The Architectural Centre'.

The Centre is located on the fringe of Vancouver's downtown, in a new building, and comprises the offices and council chamber of the Architectural Institute of B.C. surrounded by 3,500 sq. ft. of library space administered by the Association.

Essentially the Centre provides a catalogue library set up under the standard filing system of the American Institute of Architects and the Royal Architectural Institute of Canada—a library (not a showroom) of building materials and a conference room for construction industry groups.

The membership comprises all the architects and students of architecture in the Province, all consulting, structural, electrical and mechanical engineers, all building inspectors and in addition any person in the construction industry can become a member for a small annual fee.

As far as can be ascertained this is the first time, in any part of the world, that a centre for building information has been set up directly by the architectural profession. In addition to its direct practical advantages it embodies the thinking of our Institute on public relations, i.e. that if we offer something of 'concrete' advantage to the public and our colleagues in the construction industries they may come to think well of architects.

Yours truly,

WARNETT KENNEDY [*A*],
Executive Director, A.M.C.A., A.I.B.C.

The Professions and the Ex-Regular

by Air Chief Marshal Sir Ronald Ivelaw-Chapman
G.C.B., K.B.E., D.F.C., A.F.C.
Director of Resettlement to the Regular Forces Resettlement Service of the Ministry of Labour and National Service

LET ME BEGIN by thanking the editor for this opportunity to tell you about our resettlement work and its connection with the professions.

The Regular Forces Resettlement Service provides a national scheme for the resettlement of regulars—officers and other ranks—retiring prematurely or normally from the Services. Because the officer presents, relatively, the greater resettlement problem and is more likely to be drawn to the professions, my remarks will be confined to him.

The Problem

Each year until 1962, some 1,500 regular officers are to retire prematurely, in addition to normal retirements which average 4,000 annually. Most will be seeking civilian employment.

Measures Taken

The Resettlement Service co-ordinates the various advisory and placing services of the Ministry of Labour and certain voluntary organisations, notably the Officers' Association. Nationally, the Ministry is advised by the Resettlement Advisory Board consisting of Sir Frederic Hooper, Managing Director of Schweppes, Ltd., as Chairman, Major-General C. A. L. Dunphie, C.B., C.B.E., D.S.O., Chairman and Managing Director of Vickers-Armstrongs, Ltd., Mr. W. D. Goss, O.B.E., former National Secretary of the Transport and General Workers Union, Mr. W. H. McFadzean, Chairman and Managing Director of British Insulated Callender's Cables, Ltd., and Mr. J. McLean, C.B.E., Chairman of George Wills and Sons, Ltd., and past-President of the Association of British Chambers of Commerce.

The work of interviewing, advising and submitting officers to employment is undertaken by the Officers' Association in London, Glasgow and Belfast, and at 48 special local offices of the Ministry of Labour situated in the principal towns throughout Britain. Resettlement committees usually with a leading local industrialist as chairman, are functioning in Scotland, Wales and the Ministry's regions in England, at Edinburgh, Cardiff, London, Reading, Cambridge, Bristol, Birmingham, Nottingham, Manchester, Leeds and Newcastle upon Tyne. These committees aim to stimulate local interest and develop employment opportunities for ex-regulars in their areas. They provide means of obtaining expert advice on individual resettlement problems where this cannot be satisfactorily provided otherwise and their members select ex-regulars for short courses of reorientation training.

Professions

At least 50 per cent of officers retiring hope to enter industry and commerce or one of the professions associated with them, others are interested in teaching, civil service and similar careers, while some wish to emigrate. Part of my task is to explore the prospects for ex-regulars in the various professions.

At this stage I'd like to describe the sort of officer coming out. He is likely to be of major/lieut.-colonel (or equivalent) rank, aged between 35 and 45, healthy, well educated, intelligent, mature, loyal and, above all, accustomed to responsibility. A few only will have technical qualifications of professional or industrial value, but there will be good potential material in all. In outlook, he is reasonably modest and seriously minded. The officer hoping to qualify in a profession is going to take the matter realistically. He knows he will be studying alongside the normal entrant much younger than himself and probably less burdened with home commitments, that the lengthy period of training will mean sustained concentration, hard and sometimes dull work, not to mention sacrifice of leisure time and money. Nevertheless I am pretty confident that his character, personal qualities and his realisation of the value of a professional qualification as a security for the future, will see him through.

My discussions with professional bodies have centred on three questions. First, is the profession over or under populated? Secondly, are any special arrangements possible for ex-regulars? Finally, in order to provide those interested with sound preliminary advice, I seek the organisation's help in writing a short explanatory article, for publication to the Services, describing the methods of qualifying, educational standards required, and the scope for entrants over 35. I have met with the utmost co-operation from all the professional bodies I have approached, both in the preparation of this article and in their readiness to give candid advice to any serious inquirer.

Special Arrangements

Professions vary considerably in their provision for ex-regulars. For instance, both organisations for professional secretaryship allow certain types of Service administrative experience to count towards the period of qualifying service, which is the prerequisite for admission to membership. In addition they grant exemptions in one or two Intermediate subjects where certain promotion and Staff College examinations have been passed in the subjects equivalent to those of the professional syllabus. One association in a kindred profession has recently agreed to reduce the period of qualifying employment by two years where individual officers are considered suitable. Others feel they cannot go beyond advice and information, taking the view that the late entrant will need the full training time under articles to acquire adequate academic knowledge and practical experience and that it would not help to reduce the period. While I must respect and accept such expert opinion, I would have thought that individual ex-regular officers can, in maturity and education, compare favourably with university graduate entrants who have read a non-related subject and who, in some professions, are thereby accorded a two-year concession in training. These, however, are questions each profession must decide in the light of its individual circumstances and the Resettlement Service cannot do more than put the position to each.

May I finally suggest a few ways in which professional men and women can help individually in this national problem. First, their influential place in the business community may well offer the opportunity to counter any remaining prejudice in the business world that the ex-regular is too inflexibly minded, or too lacking in initiative and drive to make a success of a business career. That this is not the case is clear from the increasing number of vacancies, likely to suit ex-regulars, that are daily being notified by employers, many of whom are so impressed that they are constantly coming back, after a short interval, 'for more'. Should you hear of openings, particularly where officers over 40 may be considered, all you need do is to let the local employment exchange know. One last, and rather personal, way of helping—should you come across an ex-regular studying in your profession, I hope you may be able to offer him a word of good advice and encouragement—he's sure to welcome it at what will be, for him, a difficult time.

Chinese Domestic Architecture

PUBLICATIONS available in the West illustrate and describe only certain kinds of Chinese architecture. What might be called official buildings have been dealt with in some detail, notably in two recent publications—*The Art and Architecture of China* in the Pelican History of Art Series, in which the architectural section is written by Alexander Soper; and *Chinese Art* by William Willetts, also published by Penguin Books, in which the last chapter is on architecture.

By official architecture I mean architecture built or controlled by the central authorities, or conforming to it in character. For at least 2,000 years this kind of architecture remained remarkably constant over the whole of the Chinese Empire, representing the style of the Imperial Government in its capitals, wherever established, and in its far-flung administrative and military centres. The style remained basically the same because, in spite of such influences as Indian Buddhism and Mongol invasions, Han culture based on a feudal-bureaucratic civilisation remained dominant throughout this period. The enclosures and gate-houses of the walled cities, the halls of the palaces and temples, and to some extent the typical courtyard houses are all fairly familiar to us. There are, however, many types of buildings which do not conform to this official type of architecture—the buildings of the market towns, the villages and farmsteads, and of the minority peoples with cultures quite different from that of the dominant Han people.

A book recently published in China is the first I have seen to attempt a systematic study of the Chinese house. It shows many examples of the typical courtyard dwelling, but also other types including those of distinct groups such as the Mongols and Hakkas. It also has a study of the development of the Chinese house from late Neolithic times through the important formative period of the Han Dynasty (202 B.C.–A.D. 220) up to the Ming and Ching Dynasties.

The book, *A Short Study of the Chinese House*, is by Liu Tun-Chen based on material collected by the Chinese Architectural Research Unit formed jointly by the Architectural Research Institute and the Nanking College of Engineering. It is published by the Architectural and Engineering Publishing House.

This book contains much valuable material, though the author is the first to admit that it is only a partial study and does not represent the whole picture. The illustrations present, most often in plan form, but with a large number of photographs and drawings, the following material.

Figs. 1–35: Historical examples from excavations, burial models, stone engravings, book illustrations, etc. *36–41:* Houses circular on plan. *42–47:* Houses rectangular on plan entered at one end. *48–62:* Houses rectangular on plan entered on the long side. *63–67:* Houses L-shape on plan. *68–73:* Single-storey houses built round three sides of a courtyard. *74–76:* Similar houses with two storeys. *77–102:* Single-storey courtyard houses. *103–106:* Two-storey courtyard houses. *107–113:* Houses with a combination of open and closed courtyards. *114–117:* Hakka dwellings rectangular on plan. *118–120:* Hakka dwellings circular on plan. *121–124:* Cave dwellings.

The author draws some general conclusions about the form of Chinese houses from his study of the material collected so far.

Poor peasants, hired farm labourers and urban artisans mostly lived in small dwellings without courtyards, entered at the end, or L-shaped; or entered on the long side with one or two bays, or in small caves (underground dwellings or excavated in hillsides, in the loess districts).

Rich peasants, landlords, merchants, officials and aristocrats lived in dwellings with three or more bays, entered on the long side; in houses built round three sides of a courtyard; in enclosed courtyard houses; or in a combination of the last two.

He discusses the effect of geology and climate on such types of houses as Neolithic pits, the wooden structures which followed them, the caves in the loess areas, buildings with walls of pisé, etc. It is only for instance, in the north and north-east, with cold dry weather and little rain, that flat roofs of mud and wheat-straw are used.

The author, in discussing elevational treatment, points out that Chinese houses are often symmetrical in front but asymmetrical at the sides, and that there are two main methods of treating the front elevation: either the central feature—porch, door or window—is emphasised or the central part of the wall is dropped to give more light to the courtyard, and the ends are emphasised. In the villages and some small towns in the south there are dwellings which are asymmetrical both in front and at the sides.

It is of course impossible for anyone without a wide knowledge of Chinese domestic architecture to say whether the selection of the material is representative. It is doubtful whether even in China there are many people in a position to do so because the subject has hitherto been largely neglected. My own knowledge is limited in time to one short visit, and in place mainly to some of the larger cities and the railway lines connecting them. These latter, however, did give a good opportunity for surveying a wide range of domestic buildings from Peking to Canton.

I was struck by several types of free-standing non-courtyard houses, mostly in the central provinces. Sketches of three of these types are shown (see Figs. 1, 2 and 3). The first is a type of half-timbered house set on a brick base, with elaborate carving round the entrance, and a tiled roof; curiously similar to some half-timbered dwellings in Central Europe. The second shows a very dignified form of house with walls of rammed earth, with a recessed entrance bay closed by half-doors and decorated with carved spandrels and centre-piece above the door, and with a central ornament on the roof-ridge as well as the usual ridge terminal features. The third shows a two-storey house with recessed centre bay and a balcony. Nothing resembling these three types is shown in this book where most of the free-standing non-courtyard houses are of a simpler, poorer character.

Another interesting type of house which is not illustrated is that found in Canton, where three- or four-storey dwellings are built on very narrow but deep sites with shops on the ground floor facing the street. These could hardly be more different in character from the typical Peking courtyard house.

As the work of the Research Unit proceeds many further types of house will certainly be recorded and the author's tentative conclusions may of course be modified.

When it comes to the method of classifying and presenting the material, I think that there are grounds for some criticism. As may be seen from the list above, the classification is primarily by basic plan form rather than by stylistic character corresponding to a cultural area or group. Comment is made on the influence of the social position and wealth of the occupants and on the effect of climate and local materials, but in what seems to be rather a perfunctory manner. In order thoroughly to understand the considerable stylistic differences between the different types of dwelling—for instance between those shown in Figs. 1, 2 and 3, which are all of about

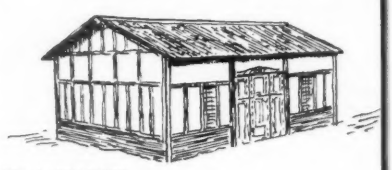


Fig. 1: KIANGSI

Fig. 2: HUNAN

Fig. 3: HOPEI

the same size—it is necessary to know a good deal more than the income and social position of the occupants, the climate and the local building materials. Clearly varying local cultural traditions are behind these differences. The fascinating glimpses of the dwellings of the Hakka people with their highly-developed sense of architectural form, call for an explanation as to how these dwellings came to be so different from, for instance, the typical Han courtyard house. If reasons for differences in form and style are going to be explained—and this is a prerequisite for a full understanding of any architecture—then the way of life that gave rise to them must be fully analysed. The methods of production, whether agricultural, handicraft or industrial, and the social organisation corresponding to them, must be studied as well as the traditions which may reach back over centuries and have a profound influence on all the art and customs of that particular group.

A study of the wider social and cultural background which gave rise to each distinctive type of dwelling would also have brought out another aspect which is neglected in this publication; that is the relationship of each house to its neighbour and to the urban or village *ensemble*. In some of the villages I have seen it is precisely the repetition of house types which gives them their fine architectural character. For instance, Fig. 4 shows how the entrance elevations of two or more adjacent houses of a courtyard type set up a rhythm which is much more interesting than that of a single house. Figs. 5 and 6 give other examples.

In our present stage of development, where town and country planning have become accepted practice, the conception of the individual house, especially if it be a small and simple one, is no longer valid. We think rather in terms of neighbourhoods and *ensembles* where the individual dwelling is only a unit contributing to the whole effect. It is disappointing that this publication, which is not simply intended as an historical study, but also as a guide to Chinese architects in their formulation of contemporary designs, does not share this approach, but seems rather to treat each house type as something which can be isolated from its environment and considered only on its own merit.

However, the main thing is that this book contains a lot of new and valuable material. It is perhaps difficult for us in Europe, where at least all the main types of domestic architecture have been studied and presented in innumerable excellent publications, to realise how important it is that this research work has been started in China, where the material is quite as rich as in Europe, and almost entirely unrecorded. This book is therefore to be heartily welcomed, I hope as the first in a long series.

R. T. F. SKINNER [*A*]

An abridged translation of the text of the book has been made by Liao Hung-Ying (Mrs. Bryan), to which the author of this article has added a few notes, and is available at Collet's Chinese Bookshop.

Fig. 4: HUNAN

Fig. 5: HUNAN

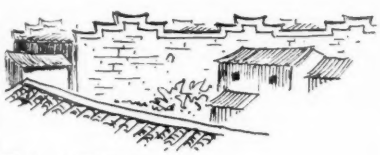


Fig. 6: KIANGSI

Book Reviews

Chinese Art, by *William Willetts.* (Pelican Books A358.) 2 vols. 7 in. Penguin Books. 1958. 15*s.* (Section on Architecture Vol. 2.)

This two-volume Pelican deals with its huge subject on a novel plan. It discusses in chronological order seven main historical phases from late neolithic times onwards, and associates with each phase one art-form which is specially characteristic of it. Thus in turn Mr. Willetts surveys prehistoric jade; bronze before and during the first millennium B.C.; Han dynasty lacquers and silk from the 2nd century B.C. to the 3rd century A.D.; Buddhist sculpture between the 3rd and 7th centuries A.D.; T'ang pottery (7th to 10th centuries); and Sung and Yüan painting and calligraphy (11th to 13th centuries). The section on architecture comes last simply because most of the remaining examples of towns and buildings date only from the Ming and Ch'ing dynasties, that is from the 14th century onwards; but the author includes some discussion of previous developments.

The book is very interesting and worth reading as a whole, and Mr. Willetts' social and technological approach to his material provides fascinatingly detailed information about the raw materials, the media and the techniques of the arts, from paper-making to sericulture. While the section on architecture is hardly at the level of the rest of the book, it is nevertheless a valuable introduction to a tradition of architecture and town planning which in relation to its historical and aesthetic importance is very poorly documented in English—in contrast to other Chinese arts such as painting and ceramics. It is written with keen appreciation of the qualities of Chinese architecture and planning, without any of the tiresome preconceptions which unfamiliarity with a foreign art often seems to encourage in us.

The illustrations are neither as numerous nor as detailed as one could wish—for instance there are not nearly enough plans—but perhaps this is inevitable in a general book of this kind. A short discussion of Chinese towns and town-planning principles is followed by a description of the plan of Peking and of the main incidents and compositions along its five-mile long axis. There are sections on the garden and its contrasts with the layout of buildings, on the main structural system used in the traditional hall and on the eaves bracketing systems. There is a discussion of the origin of the curved roof, a section on pagodas and a most interesting section on bridges, including a note on the 6th-century 'Great Stone Bridge' in Hopei with its single, flat segmental arch of 123 ft. span, one of the greatest bridges in all history.

It is possible to criticise in Mr. Willetts a tendency to overstress technical considerations such as materials and structure as causes of architectural forms and their change, as for instance where he attributes the stability of Chinese architectural forms, in contrast to the variety of historical styles typical of Europe, to the Chinese use of wood as a building material. There have been far too many changes in European architecture *not* accompanied by changes in materials or structure for such a theory to be tenable.

It is a limitation of the architectural chapters, of which it would be churlish to complain within the scope of the book as a whole, that only a few main aspects of 'official' building have been examined and, for example, the wealth and variety of domestic building hardly touched upon. It is a more serious limitation that the sources are still in the main the comparatively small stock of European books, and that very little use has been made of the rapidly increasing volume of contemporary Chinese publications and studies.

ANDREW BOYD [*A*]

The Early Architecture of Georgia, by *F. D. Nichols.* 13 in. xv + 292 pp. incl. illus. Chapel Hill: University of North Carolina Press; London: O.U.P. 1957. £6.

This is an exquisitely produced book, about which it would be impertinent for an Englishman to comment in detail. It is firstly a pictorial survey of great interest, principally compiled from the work of the late Frances Benjamin Johnston, who for more than half a century photographed the historical buildings of the United States with energy, judgment and taste. Secondly, it is an authoritative, fully documented analysis of the architecture of the state in the Colonial and pre-Civil War eras. Some early plans are included.

J. C. P.

North Somerset and Bristol, by *Nikolaus Pevsner*. (The Buildings of England series, BE 13.) 7¼ in. 510 pp. incl. illus. + 72 pls. Harmondsworth: Penguin Books. 1958. 10*s*. 6*d*. (paper ed.).

It was not surprising to find Somerset divided into two volumes; this one takes in nearly half the county, viz., the north-east part adjoining Gloucestershire and Wiltshire, including Bath and Wells but not Glastonbury; Bristol (formerly in Gloucestershire and Somerset) has a separate section. Perhaps the most valuable single contribution is the thorough re-assessment of Wells Cathedral, including the documentary dating of the western half, that work of pioneering Gothic. Unusual features that strike one are the curious concave external outlines (so to say) of a Bristol monument and St. Mary Redcliffe doorway, both of the early 14th century; of the latter an Indian inspiration is quoted, one would have thought Spanish or Portuguese. Striking also are the all-tracery windows of Clevedon Court of the same period. The comparative elevations of church towers (reminiscent of Gerald Cobb's on those in the City of London) are a happy thought. Domestically, a find is the former house in Small Street, Bristol, obviously the 'Colston's House' of Garner & Stratton and Banister Fletcher that the reviewer long ago gave up as lost. The usual invaluable survey of work by periods in the Introduction includes examples by Bodley, Sedding and Leonard Stokes, and the outstanding Central Library, Bristol, by Holden, is illustrated. There are 'plans' of the two Cathedrals which, however, only show the eastern parts, and there is one of that remarkable group, the precinct and market-place of Wells.

South and West Somerset, by *Nikolaus Pevsner*. (The Buildings of England series, BE 14.) 7 in. 394 + 'notes' pp. including double-pl. map + 56 pls. and pp. of illus. Harmondsworth: Penguin Books. 1958. 8*s*. 6*d*. (paper ed.).

The chief place included in this second volume on the county is Glastonbury, which is adequately described; a block plan would have made clearer the relation between the abbey and other buildings and the excavated Saxon remains. Culbone is also included, with the question whether it is England's smallest church left open. Other features of special interest are Norman sculptures, a 14th-century tall reredos (from Wellington) and curious cresting over a tomb-recess (at Pendomer); the varied and lovely manor-houses are done justice to, including 'most lovable' Montacute, and a good specimen of Kempe's glass is illustrated. The full Introduction (61 pages)—the same in both volumes, with initials to differentiate the volume references—is, as often, the best thing in the book. Page references in the captions, reversing the plate references in the text margins, would be useful if there is room for them.

H. V. M. R.

Notes and Notices

NOTICES

Inaugural General Meeting, Tuesday 4 November 1958 at 6 p.m. The Inaugural General Meeting of the Session 1958–59 will be held on Tuesday 4 November 1958 at 6 p.m. for the following purposes:—

To read the Minutes of the Ninth General Meeting of the Session 1957–58 held on 17 June.

Mr. Basil Spence, O.B.E., A.R.A., A.R.S.A., President, to deliver his Inaugural Address.

To unveil the portrait of Mr. Kenneth M. B. Cross, M.A., D.C.L., Past President, by Mr. A. R. Middleton Todd, R.A.

To present the London Architecture Bronze Medal 1957 to Messrs. Edward Armstrong and Frederick MacManus [*FF*] for Brunel House, 105 Cheyne Walk. Chelsea, S.W.10.

To present R.I.B.A. Awards for Distinction in Town Planning to Mr. Anthony Minoprio, M.A., A.M.T.P.I. [*F*] and Mr. J. Lewis Womersley, M.T.P.I. [*F*].

(Light refreshments will be provided before the meeting.)

Science Lecture, Tuesday 21 October 1958, at 6 p.m. There will be a Science Lecture at 6 p.m. on Tuesday 21 October when Mr. R. Llewelyn Davies, M.A. [*F*] and Mr. John Weeks [*A*] will read papers on 'Progress in Hospital Planning'.

(Light refreshments will be provided before the meeting.)

British Architects' Conference, Cardiff, 10–13 June 1959. The British Architects' Conference in 1959 will be held at Cardiff from 10 to 13 June, at the invitation of the South Wales Institute of Architects. Particulars of the programme will be issued in due course.

Classes of Retired Members. Under the provisions of Bye-law 15 applications may be received from those members who are eligible for transfer to the class of 'Retired Fellows', 'Retired Associates' or 'Retired Licentiates'.

The Bye-law is as follows: 'Any Fellow, Associate or Licentiate who has reached the age of 55 and has retired from practice may, subject to the approval of the Council, be transferred without election to the class of "Retired Fellows", "Retired Associates", or "Retired Licentiates", as the case may be, but in such case his interest in, or claim against the property of the Royal Institute shall cease.'

'The amount of the annual subscription payable by such "Retired Fellow", "Retired Associate", or "Retired Licentiate" shall be one guinea, or such amount as may be determined by resolution of the Council, excepting in the case of those who have paid subscriptions as full members for 30 years, and who shall be exempt from further payment. A "Retired Fellow", "Retired Associate", or "Retired Licentiate" shall have the right to use the affix of his class with the word "Retired" after it, shall be entitled to receive the JOURNAL and Kalendar, shall be entitled to the use of the Library, and shall have the right to attend General Meetings, but shall not be entitled to vote. A "Retired Fellow", "Retired Associate", or "Retired Licentiate" shall not engage in any avocation which in the opinion of the Council is inconsistent with that of architecture. Nothing contained in this Bye-law shall affect the rights of persons who at the date of the passing of this Bye-law are members of the classes of "Retired Fellows" and "Retired Members of the Society of Architects".'

Formal Admission of New Members at General Meetings. New members will be asked to notify the Secretary, R.I.B.A., beforehand of the date of the General Meeting at which they desire to be introduced and a printed postcard will be sent to each newly elected member for this purpose. On arrival at the R.I.B.A. on the evening of the General Meeting new members must notify the office of their presence and will then take their places in the seats specially numbered and reserved for their use. On being asked to present themselves for formal admission, the new members will file out in turn into the left-hand aisle and after shaking hands with the President (or Chairman) will return to their seats by way of the centre aisle.

Formal admission will take place at all the Ordinary General Meetings of the Session, with the exception of the following: 4 November 1958, Inaugural Meeting; 3 February 1959, Presentation of Prizes; 7 April 1959, Presentation of Royal Gold Medal.

CURRENT R.I.B.A. PUBLICATIONS

The following is a list of the main R.I.B.A. publications with their prices.

Agreement, Forms of
Form of Agreement for General Use between a Private Building Owner and an Architect or a Firm of Architects.

Form of Agreement for General Use between a Building Owner (being a Statutory Authority) and an Architect or a Firm of Architects.

Form of Agreement between a Local Authority and a Firm of Architects for Housing Work.

Form of Agreement between a Local Authority and a Firm of Architects for Multi-Storey Flats.

Form of Agreement between the Promoters and a Firm of Architects appointed as the Result of a Competition.

Price 6*d*. per form (inclusive of purchase tax). Postage 4½*d*.

Architect and His Work, The
Price 6*d*. Postage 4½*d*.

Before You Build. Free

Certificates, Architects', Form Prepared by the Practice Committee
Copyright Book of 100 Certificates.
Price 17*s*. (inclusive of purchase tax). Postage 1*s*. 6*d*.

Conditions of Engagement and Scale of Professional Charges
Price 6*d*. Postage 3*d*.

Contract, Form of Agreement and Schedule of Conditions
For use with quantities: 1939 revised 1957. Copyright.

For use without quantities: 1939 revised 1957. Copyright.
Price 2*s*. 2*d*. per form (inclusive of purchase tax). Postage 6*d*.

Adapted for the use of Local Authorities, for use with quantities: 1939 revised 1957. Copyright.

Adapted for the use of Local Authorities, for use without quantities: 1939 revised 1957. Copyright.
Price 2*s*. 5½*d*. per form (inclusive of purchase tax). Postage 6*d*.

Fixed Fee Form of Prime Cost Contract for use in the repair of war-damaged property: 1946 revised 1956. Copyright.
Price 2*s*. 2*d*. (inclusive of purchase tax). Postage 6*d*.

Cost Plus Percentage Form of Prime Cost Contract for use in the repair of war-damaged property: 1946 revised 1956. Copyright. Price 2*s.* 2*d.* (inclusive of purchase tax). Postage 6*d.*

Examination, Intermediate, Questions Set At
Price 1*s.* per examination. Postage 4½*d.*

Examination, Professional Practice, Questions Set At
Price 6*d.* per examination. Postage 3*d.*

Examinations, Final and Special Final, Questions Set At
Price 1*s.* per examination. Postage 4½*d.*

Forms of Articles of Pupilage
Copyright. Price 1*s.* 8*d.* (inclusive of purchase tax). Postage 3*d.*

Membership of the R.I.B.A.
Particulars of the Qualifications for Associateship.
Price 2*s.* 6*d.* Postage 6*d.*

Party Wall Notice Forms, for Use Under the London Building Act

Form A—Party Structures.

Form B—Party Fence Walls.

Form C—Intention to Build within Ten Feet and at a lower level than the bottom of the foundations of adjoining Owner's Building.

Form D—Intention to build within Twenty Feet of the adjoining Owner's Independent Building and to a depth as defined in Section 50(1)(*b*).

Form E—Party Walls and Party Fence Walls on line of Junction of adjoining lands.

Form F—Walls or Fence Walls on Building Owner's land with footings and foundations projecting into adjoining Owner's land.

Form G—Selection of Third Surveyor.
Price 7*d.* per form (inclusive of purchase tax): Postage 3*d.*

Prizes and Studentships (Pamphlet)
Price 3*s.* Postage 6*d.*

Tender, Form of, for use by Nominated Suppliers
Price 2*d.* per form. Postage 3*s.* 2*d.* per dozen (Post free).

Symposia Reports

Family Life in High Density Housing, with particular reference to the Design of Space about Buildings. Price 10*s.* Postage 8*d.*

Design of Teaching Laboratories in Universities and Colleges of Advanced Technology. Price 7*s.* 6*d.* Postage free.

Design Pays, the Private Enterprise House and its Setting. Price 5*s.* Postage free.

Correspondence with the Institute. In order to facilitate speedier attention to correspondence, and to relieve the staff of a great deal of research, it is particularly requested that members and Students will kindly state in all correspondence with the Institute the class of membership (*F*, *A*, *L* or *Student*) to which they belong.

COMPETITIONS

New Technical College, Glasgow. Last date for submitting designs: 8 December 1958.
Full particulars were published in the JOURNAL for September, page 395.

Wokingham County Infants' School. Last date for submitting designs: 15 December 1958.
Full particulars were published in the JOURNAL for August, page 355.

International Competition. A note has been received from the International Union of Architects that the conditions of the following competition have been approved by them:

Monument to Jose Batlle, Montevideo (Uruguay). Last day for submitting designs is 15 December for competitors living in Uruguay, Argentina, Brazil and Paraguay, and for competitors elsewhere, 30 December 1958.
Full particulars were published in the JOURNAL for July, page 323.

ALLIED SOCIETIES

Changes of Officers and Addresses

Gloucestershire Architectural Association. Hon. Secretary, P. B. Davenport [*A*], Winstone, Pittville Circus Road, Cheltenham, Glos.

Institute of South African Architects. The Institute's postal address is now P.O. Box 7322, Johannesburg, South Africa.

Institute of Northern Rhodesian Architects. President, A. H. Lewis [*A*].

Indian Institute of Architects. President, B. D. Mhatre. Joint Hon. Secretaries, A. S. Patil [*F*] and C. S. H. Jhabvala [*A*], Prospect Chambers Annexe, Dr. Dadabhai Naoroji Road, Fort, Bombay, India.

Institute of Architects of Malaya. President, Rolf Koren [*A*], c/o Messrs. E. E. Keen and Partners, P.O. Box 288, Bank of China Building, 1st Floor, Battery Road, Singapore, 1.

GENERAL NOTES

Architects' Christian Union. An informal reception will be held in the R.I.B.A. Jarvis Hall on Thursday 16 October 1958, from 6.30 to 8.30 p.m. (with buffet) and will be open to all members of the profession to meet the guest speaker, the Rt. Rev. Hugh R. Gough, O.B.E., M.A., Bishop of Barking.

S.P.A.B. Annual Course on Repair of Ancient Buildings. The Society for the Protection of Ancient Buildings is again providing facilities for architects and surveyors interested in and responsible for old buildings to obtain knowledge of its principles and methods of repair, and is arranging its annual course, consisting of lectures, discussions and visits, to cover the many important aspects of repair work.

The Society is anxious to secure that those dealing with old buildings should understand not only traditional constructional methods, but also the principles underlying the sympathetic and conservative treatment of old buildings, whether ecclesiastical or secular. In view of the specialist nature of work of this character, the Society believes that the opportunity to study at first hand some of the problems which arise will be helpful to architects interested in this subject.

It is hoped that local authorities and others who have buildings in their care or have dealings with them will be able to give facilities to the architect members of their staff to take advantage of this scheme.

The Society instituted this specialised course in 1951, and it has been held annually since then. Over the period, more than 200 architects have had the opportunity of seeing how the problems of repairs are met, and many hundreds of miles have been travelled to various parts of the country to see the particular jobs in progress. It is on the practical aspect of the course that the Society lays emphasis.

The course will be held from Monday 13 October to Saturday 18 October 1958, and the Society invites those who are interested to apply for further details to: The Secretary, S.P.A.B., 55 Great Ormond Street, London, W.C.1 (Holborn 2646).

Review of Construction and Materials. In the note on the Wallfold folding doors and walls on page 389 of the September issue of the JOURNAL, the address of the makers, Home Fittings (Great Britain) Ltd., should have been given as Victoria Works, Hill Top, West Bromwich, Staffs.

The aluminium refuse hoppers produced by Code Designs Ltd., were developed at the request of and in conjunction with the London County Council.

Mannheim Conference on Community and Neighbourhood Planning. A conference on 'Community and Neighbourhood Planning—the Town and its Outskirts' is to be held by the Deutscher Verband für Wohnungswesen, Städtebau and Raumplanung at its twelfth annual meeting at Mannheim from 24 to 25 October 1958.

Further information on the conference and details about participation can be obtained from the general secretariat of the organisation at Köln, Hohenzollernring 79–81, German Federal Republic.

Harvard Graduate School of Design. Advanced Studies. The Harvard Graduate School of Design receives numerous requests from advanced students and professionals in many countries who wish to work on special design projects or on related research without becoming candidates for a degree. Neither the professional graduate curricula in architecture, landscape architecture, and city planning nor the programme leading to the Ph.D. degree will meet the needs of such persons. The Faculty of Design has accordingly established an advisory Committee on Advanced Studies.

The Committee is now ready to hear from advanced scholars and professionals who are not candidates for a degree but who may wish to carry out special projects in architecture, landscape architecture, or city and regional planning. If accepted, they would work independently but with occasional guidance from one or more members of the Faculty or of the research staff of the School's Center for Urban Studies. Only applicants of demonstrated competence and advanced professional accomplishment will be considered.

In their scope, proposed projects might embrace any aspect of man's physical environment. For example, there exists a need for intensive research into the *design aspects* of: the industrialisation of the building industry; the development of new construction methods and materials; the growing mobility of society through rapid advances in means and methods of transportation; and the increasing artificial control of climate. These possible areas of study are by no means exclusive of others that may recommend themselves.

Any person desiring to have the Graduate School of Design consider his proposed programme of advanced study should send to the Chairman, Committee on Advanced Studies, Robinson Hall, Harvard University, Cambridge 38, Massachusetts, an outline of his proposals, including at least the following: an explicit description of the character and extent of his proposed project; an indication, as specific as possible, as to the Faculty member or members under whose occasional guidance he would wish to work; full credentials as to his educational background and professional experience; visual evidence of his design abilities and practical skills; and a clear statement as to how he proposes to finance his programme of study. Personal letters of recommendation supporting the candidate's proposals should be sent directly to the Chairman of the Committee.

Potential applicants are advised that under

present conditions a minimum of approximately $2,500 per annum is needed for fees and living expenses; the Counsellor for Foreign Students suggests that a wiser figure for students from abroad would be $3,000 per annum.

Society of Architectural Historians of Great Britain. The first annual general meeting of the Society of Architectural Historians *of* Great Britain (as it is to be known in future), took place at York on Saturday, 30 August. Forty members of the Society, representing roughly one-third of the total membership, as well as representatives of the Society of Architectural Historians in the U.S.A., attended the meeting which was under the chairmanship of Dr. W. A. Singleton [*F*].

The adoption of the proposed constitution was formally moved by Professor H.-R. Hitchcock [*H.C.M. United States*], seconded by John Gloag [*Hon. A.*] and carried unanimously. The following officers and committee were then elected: *President:* Professor R. A. Cordingley [*F*]; *Chairman:* Dr. Singleton; *Hon. Secretary:* Frank I. Jenkins [*A*]; *Hon. Treasurer:* Dr. Derek Buttle [*A*]; *Editor of* ARCHITECTURAL HISTORY: John P. West-Taylor; *Executive Committee:* Bruce Allsopp [*F*]; John Brandon-Jones [*A*]; F. F. Fielden [*F*]; Dr. J. Quentin Hughes [*A*]; Dr. Peter Murray; R. B. Wragg [*A*].

Following the business meeting Professor Geoffrey Webb, C.B.E. [*Hon. A.*], Secretary to the Royal Commission on Historical Monuments, delivered the annual address, his subject being 'The History of Architectural History'.

In the evening 35 members attended a dinner in the Merchant Taylors' Hall, York, when Professor Hitchcock made public his offer to the Society of an annual book award in memory of his mother. The award, to be known as the 'Alice Davis Hitchcock Memorial Book Award', is to be made by the Society each year for an outstanding work on architectural history. On behalf of the Executive Committee, the President, Professor Cordingley, thanked Professor Hitchcock for his much-appreciated and generous gesture.

On Sunday, 31 August, the following papers were presented by members: John Gloag: 'Architecture and Technology: the development of the domestic window'; Dr. Susan Lang: 'A Problem of the Italian Renaissance'; Dr. Peter Murray: 'The Aesthetic Theory of Robert Adam'; and Professor H.-R. Hitchcock: 'The Early Work of Gaudi.'

Advance copies of the Society's journal, ARCHITECTURAL HISTORY, were available for inspection at the meetings. A 96-page volume with some 50 illustrations, the journal includes contributions by Howard Colvin [*Hon. A*], John Brandon-Jones, Professor Cordingley and Michael Port as well as complete records, in the form of drawings, of Oriel Chambers, Liverpool. Its production has been made possible by the generous co-operation of the Rector and Council of King's College, Newcastle upon Tyne.

R.I.B.A. Cricket Club

R.I.B.A. v. Club Cricket Conference. This, the last match of the season, was played at Wimbledon on 27 August and was lost by 9 wickets. The R.I.B.A. batted first and largely as the result of two early run-outs made only 145 of which the backbone was a fine innings of 44 not out by G. Tyson. J. Seward (24) and C. A. R. Norton (24) shared in useful stands with Tyson. For the C.C.C., T. Burton took 3 for 25 and N. Hall 4 for 40.

The C.C.C. lost an early wicket, but after tea B. Wooton (62 not out) and D. J. Newton (75 not out) got well set and knocked off the runs without further loss.

Obituaries

Burjor Sorabshaw Jamshedji Aga [*F*] died on 26 March 1958, aged 78.

Mr. Aga was educated at the Bombay Proprietary High School, Rhinestone College, and the College of Science in Poona, and subsequently joined Bombay Municipality as Inspector of Roads and Municipal Houses. In 1907 he became a partner in the firm of Messrs. Shapoorjee N. Chandabhoy and Co. in Bombay. The firm had been founded by his maternal grandfather, the late Nusserwanji Chandabhoy and continued by Mr. Aga's uncle, Mr. Shapoorjee N. Chandabhoy. Mr. Jamshed Burjor Aga [*L*], Mr. Aga's son, was later taken into partnership.

Among Mr. Aga's works were various public buildings including the Royal Western India Turf Club, Ltd., the Framji Cawasji Institute Building, the Stock Exchange Building, Marwari Vidyalaya, Seth Mancherji Cama Athornan Institute, all in Bombay, and the Sirdar Dastur School, Chattri (Temple) at Wanowrie, Poona. He was the architect for the Polytechnic Institute at Lashkar, Gwalior, and designed a secretariat, school, and hospital in the then Gwalior State, and also the new Vithoba Temple at Sanquelim, Goa, for Her Highness the Maharani Saheba Gajra Rani Scindia of Gwalior. He was also concerned with the new guest house, school building, and Indrajit Padmani Mahal palace for the then Rajpipla State, and the Mahal secretariat and school buildings for His Late Highness the Maharajasaheb of Devgadh-Baria.

Mr. Aga acted as an honorary architect for several charitable institutions in Bombay and Mofussil, including the Bai Avabai Framji Petit Parsi Girls' Orphanage and Bai Shirinbai Cama Convalescent Home, Bandra, the Zoroastrian Building Society Ltd., and the Sir Ratan Tata Industrial Institute, and he had at various times served on their committees as a member, director and chairman. Several residential buildings for poor Parsis were designed and erected by him, including the Sir Ratan Tata Charities Buildings in Sir Cowasjee Jehangir Colony at Tardeo.

From 1931–32 he was President of the Indian Institute of Architects—the first Indian and Parsi to obtain this honour—and had represented that body on the R.I.B.A. Council and the Allied Societies' Conference. He had also been an examiner for the R.I.B.A. Final and Special Final Examinations held in India.

In 1928 he was elected a Justice of the Peace, and he was appointed arbitrator to fix the rateable values of all buildings belonging to the Government of Bombay for the quinquennial 1944–49.

He was a senior Mason in the English Constitution and a member of the Willingdon Club, the Ripon Club, and the R.W.I.T.C., Ltd., Bombay, although ill health had forced him to resign from many of his activities.

George Crossley [*Retd. F*] died on 16 June 1958, aged 70.

Mr. Crossley was educated at Belle Vue Grammar School, Bradford, and received his training in the office of the late Benjamin Dobson and at Bradford Technical College. He was with the Bradford City Architect's Department from 1912 until 1932 when he became chief architectural assistant and deputy borough engineer of Huddersfield Corporation. Five years later he was appointed education architect. He retired in 1952.

Mr. Crossley's principal works in Huddersfield included extensions to Royds Hall Grammar School and King James's Grammar School, Almondbury; the new Dalton and Deighton County Primary Schools; the domestic science, electrical engineering, motor engineering and building department workshops for Huddersfield School of Technology; and Rawthorpe County Secondary School and Almondbury County Primary School (completed after his retirement).

Edwin Gunn [*Retd. A*] died on 4 July 1958, aged 80.

Mr. Gunn, who was born in Stratford, Essex, received his architectural training at the A.A. School (where he won the Advanced Design Medal in 1902) and in the office of Mr. Alfred Frampton [*A*]. He was in private practice in Ruislip from 1912 until the First World War when he served in the Metropolitan Special Constabulary, the R.N.V.R. and the R.G.A. He served with the R.G.A. for two and a half years in France and Flanders, including the campaigns of Arras (1917), Passchendaele (1917–18), and the second battle of the Somme (1918) until the Armistice.

In 1920 he became superintending architect with the Ministry of Agriculture, where he remained for 14 years and gained a close acquaintance with the English countryside from Yorkshire to Cornwall. Mr. Gunn went to Minehead in 1934 in semi-retirement, but subsequently resumed practice and eventually took Mr. A. F. Fry [*A*] into partnership. He was soon immersed in architectural work, honorary and otherwise.

Mr. Gunn will be mainly remembered as the designer of the Minehead swimming pool (1935) and the layout and houses forming the Minehead U.D.C.'s Quarry Close Housing Estate (1945), which was awarded the Ministry of Health's medal in the South-West region. His own preference was known to be for his work on The Ball, which rescued that ancient and picturesque thoroughfare from becoming a mere back way populated by dustbins. In all Mr. Gunn designed some hundreds of houses in and around Minehead, before a stroke in 1948 compelled him to retire from practice.

Mr. Gunn had been successively Hon. Librarian, Hon. Editor and Hon. Secretary to the A.A. and subsequently member of the R.I.B.A. Council through several sessions, both before and after the 1914–18 War, and had served on the Science Standing Committee, B.S.I. Committees, Examinations Committee, Art and Practice Standing Committees, the Records Committee and the Board of Architectural Education. He had been a representative of the R.I.B.A. on the A.R.C.U.K. Board of Architectural Education and Admission Committee. He had also served as an examiner in the R.I.B.A. Final and Special Final Examinations and as examiner to the Cambridge University Estate Management Department for several years. Up to the time of his breakdown he was architect to the Society for the Protection of Ancient Buildings and Joint Honorary Secretary of the West Somerset Branch of the Somerset Archaeological Society, and for ten years from 1938 was the honorary architect to the Minehead and West Somerset Hospital.

Mr. Gunn was also well known as a writer on technical subjects relating to building and had several books to his credit including *Economy in House Design*, *Modern Building Technique*, *Farm Buildings*, *How to Heat Your House*, and *Little Things that Matter for those who Build*.

Edward John Harman, F.R.I.C.S. [*L*], died on 13 June 1958, aged 60.

Mr. Harman received part of his training in the office of Messrs. Alfred Saville and Sons, and he commenced private practice about 1929 in Chelsea.

Among his principal works were St. Mark's School, Fulham, St. Nicholas School, Shepperton, Middlesex, the rebuilding of No. 63, Cheyne Walk, Chelsea, and the reconstruction of part of Chelsea Public Library.

Sir John Marshall, C.I.E., Litt.D., D.Litt. [*Hon. A*] died on 17 August 1958, aged 82.

Sir John, who was elected an Honorary Associate in 1912, was Director-General of Archaeology in India from 1902 to 1931. Sir John was not only the first to carry out excavations on strictly scientific lines in India, but he also ensured that the preservation of the ancient monuments became the foremost duty of his department. His most famous excavations were at Sanchi in Central India, Taxila in the Punjab, and Mohenjo-daro in Sind. At Taxila he uncovered the successive cultures of a major Indian city through ten formative centuries (500 B.C. to A.D. 500) and at Mohenjo-daro excavations under his direction in 1925 brought to light a large city of well-built brick houses belonging to a period between 3250 and 2750 B.C.

In the work of preservation and repair of the many decaying monuments in India and Burma, he took special pride in the restoration of the ancient gardens which surrounded many of the Mogul monuments and the designing of new ones to enhance the beauty of the architecture.

From 1902–28 he was editor and part author of the Annual Reports of the Archaeological Survey of India and he published the results of his excavations in *A Guide to Sanchi*, *A Guide to Taxila*, *Mohenjo-daro and the Indus Civilisation*, *The Monuments of Sanchi*, *Taxila*, and *The Buddhist Art of Gandhara*.

Herbert Thompson Rainger [*F*], died on 25 March 1958, aged 74.

Mr. W. J. Rogers [*F*] writes:—

'Mr. Rainger was a native of Cheltenham and was educated at Dean Close School.

'He was articled to Mr. F. W. Waller [*F*] of Gloucester and, after holding appointments in Bristol, practised as a partner in the firm of Chatters, Smithson and Rainger, of Cheltenham. On the retirement and decease of his respective partners he entered into partnership with Mr. W. J. Rogers [*F*] in 1923. Mr. G. H. Smithson [*A*] and Mr. Rainger's son, Mr. R. C. Rainger [*A*], later joined the firm which, at the time of his death, was styled Rainger, Rogers and Smithson.

'Mr. Rainger was concerned with the conversion of Coliseum Theatre, Cheltenham; the erection of the Cottage Hospital at Clydach, Glamorgan, Emmanuel Church, Cheltenham, and buildings at Dean Close School, Cheltenham; with housing schemes for Cheltenham and Tewkesbury Borough Councils, Cheltenham, Thornbury and Lydney R.D.Cs., and Charlton Kings U.D.C.; the erection and maintenance of buildings and stands at Cheltenham, Gatwick, Towcester, Fontwell Park, Hawthorn Hill, Folkestone, Lewes and other racecourses; and with industrial and business premises and much private housing.

'His particular interests were Regency and Cotswold traditional architecture, of which his knowledge was extensive and his handling sympathetic. During the First World War he served with the Inns of Court Rifles and, after being invalided out, was associated, as Architectural Consultant, with Handley Page Aircraft.

'He was a past-President of the Gloucestershire Architectural Association and a founder member of the Cheltenham Regency Society and the Cheltenham Operatic and Dramatic Society.

'Mr. Rainger loved his profession, and was actively engaged in practice up to the time of his death.'

Gerald Victor Richards [*A*] died on 23 July 1958, aged 34.

Mr. Richards received his architectural training in the Department of Architecture, Kingston-upon-Thames School of Art and at the A.A. He was in the office of Messrs. James Cubitt and Partners [*F*/*A*] until 1956 when he took up the appointment of Assistant Architect to Somerset County Council.

Mr. James Cubitt, M.B.E. [*F*] writes:

'To many of those who knew him Gerry Richards' death in a car crash was all the more pitiful since he had survived many hazards as a war-time pilot in the Fleet Air Arm. To me, who knew and loved him well, the early death of so vivid, so high-spirited, so sweet a friend, is an outrage, while his promise, as architect and artist, makes it particularly hard to write adequately of him. Promise is not performance, unfortunately. He had ample ability, quickness and flexibility. He was very direct and perhaps architecture is often an indirect sort of art. His latest work, for the Somerset County Architect, will shortly be published. His vitality and intuition were easily transposed onto paper—less easily onto canvas, but that would have come—and he had the first-rate artist's ability to fill the frame without effort. He had also the true artist's integrity, unwavering and yet introspective, without which it is I believe impossible to reach the heights. No one can say what his level might have been. I think it would have been very high for he had matured remarkably since taking the difficult decision to leave us, 21 months ago, to go to Somerset. While engaged with himself, as are all artists, he had come to terms with others, had gained assurance without losing sensibility, serenity without losing his vivid warmth of heart and generosity of disposition. The gem was ready but the cutting will never now be completed.'

Leonard Percy Williams [*A*] died at Accra after a sudden illness on 11 December 1957, at the early age of 43.

Mr. Bernard G. White [*A*], Hon. Secretary, Ghana Society of Architects, writes:

'Mr. Williams received his training at the Regent St. Polytechnic School of Architecture, and completed his studies at the Royal Academy School in 1939.

'Whilst studying, he worked as an assistant in the Architect's Department of H.M. War Office from 1938 to 1941, when he joined the Royal Navy and became a Fleet Air Arm pilot. After the war, he became a Senior Architect with the P.W.D., Hong Kong, and was responsible for many of the island's multi-storey flats.

'In 1949, he reverted to private practice and opened up a Singapore branch for Mr. W. H. Kwan [*F*], where he built up a general practice. For family reasons, he returned to U.K. in 1951 and was appointed Deputy Chief Architect, Basildon Development Corporation, under Mr. Noel Tweddell [*A*]. In 1954, he joined the P.W.D. (Ghana) where he held the post of a senior architect and later as a regional architect.

'He was closely concerned with the Ghana Society of Architects and was the Society's Treasurer at the time of his death.'

Members' Column

This column is reserved for notices of changes of address, partnerships vacant or wanted, practices for sale or wanted, office accommodation, and personal notices other than of posts wanted as salaried assistants for which the Institute's Employment Register is maintained.

APPOINTMENTS

Mr. J. Austen Bent, A.M.T.P.I. [*A*], relinquished his post of Chief Technical Officer and Assistant General Manager of the Scottish Special Housing Association, Ltd., on his appointment on 1 October as Director of Housing to the City of Manchester.

Mr. L. A. A. Blomfield [*A*] has been appointed Director of Works and Training to the Builders Brigade of Ghana. His address is now c/o Builders Brigade, P.O. Box 1853, Accra, Ghana.

Mr. K. L. Datta [*A*] has been appointed Reader in Architecture and Architect to the University of Roorkee, Roorkee (U.P.), India, where he will be pleased to receive trade literature, samples of materials and other information which can be useful in teaching architecture.

Mr. Moreshwar Ganpatrao Desai, B.A. (Bombay), Dipl.Arch. (U.C.L.) [*F*], Consulting Architect to the Government of Madras, has retired from Government Service and has been appointed Professor of Architecture, University of Madras. He will be pleased to receive trade literature, etc., at 138 Palace Road, San Thome, Madras 4, S. India.

Mr. A. W. Elliott [*A*] resigned his appointment as Education Architect to Oldham Education Committee to take up the post of Architect to the Midlands Electricity Board, Mucklow Hill, Halesowen, near Birmingham on 1 September. His private address is now 57 Beckman Road, Pedmore, Stourbridge, Worcs.

Mr. James Ronald Firth [*A*] has resigned his post as Lecturer in the Faculty of Architecture, University of Hong Kong, to take up the appointment of Architect to the Hong Kong Housing Authority, General Post Office Building, Hong Kong. Mr. Firth will welcome the exchange of information and literature from organisations connected with low-cost housing, and research on housing problems and economics.

Mr. Brian Hogan [*A*] has been appointed Chief Architect (Design Division), Public Works Department, Kuwait, where he will be pleased to continue receiving trade catalogues relating to building in the tropics.

Mr. P. H. M. Stevens [*A*] has resigned his position as Town Planning Officer on the staff of the Housing Adviser to the Colonial Office and Colonial Liaison Officer, Building Research Station, on his appointment as Town Planning Officer to the Government of Barbados. His address is now c/o Ministry of Communications, Works and Housing, Government Headquarters, Bay Street, St. Michael, Barbados, B.W.I.

PRACTICES AND PARTNERSHIPS

Mr. Charles G. Cooper [*A*] has become an associate partner in Nigeria of the firm of **J. E. K. Harrison, Potter, Hare and Macfarlane** [*F*/*A*] of London and Ibadan. His address is now at the Ibadan office, Co-operative Bank Building, Private Mail Bag 5178, Ibadan, Nigeria, where he will be pleased to receive trade catalogues, etc.

Mr. John Dudley Coxon [*A*] has commenced practice on his own account at 14 Grey Street, Newcastle upon Tyne, 1 (Newcastle 24746), where he will receive trade literature.

Mr. J. C. Everitt [*L*], practising as **Barton and Everitt,** has taken **Mr. D. A. Calow** [*A*] into partnership. The practice will now be styled **Barton, Everitt and Calow** and the address has been changed from 93 to 107 London Road, Leicester.

The partnership of **George and Thomas (Alfred George** [*L*] and **H. Keith Thomas** [*A*]) at 67 High Street, Merthyr Tydfil, Glamorgan, has been dissolved as from 1 January 1957. The practice is now carried on by Mr. H. Keith Thomas under his own name.

Mr. G. E. Grey [*A*] has set up his own practice at Penmaen House, Belper, Derby (Belper 861–2).

Mr. Neil Hutchison [*A*] has commenced practice at 33 Boulevard de Clichy, Paris, 9, France (Pigalle 95–16).

Mr. D. H. Matthews [*A*] and **Mr. A. N. Martel** [*A*] have gone into partnership with **Mr. K. James-Milnes,** Arch.N.A.G., and the new firm is practising under the style of **Matthews, Milnes and Martel** at the following addresses: 130b High Street, Amersham, Bucks.; Zijdeweg 12, Wassenaar, Holland: and Edificio Choroni 3-C, Calle Real de Sabana Grande, Caracas, Venezuela. Mr. Matthews and Mr. Martel have been elected members of the Nederlands Architecten Genootschap (N.A.G.).

Mr. Neil Orchard [*A*] has taken **Mr. David C. Allison** [*A*] into partnership under the style of **Orchard and Allison** at 19 Morgan Street, Auckland, S.E.1, New Zealand, where trade catalogues will be welcome.

Messrs. Redfern, Briggs and Partners have commenced practice at 28 Clarendon Street, Nottingham. The partners are **Mr. John Bedford Diamond** [*A*], **Mr. Peter Rowland Hodgkinson** [*A*], **Mr. James Francis Briggs** [*A*], **Mr. Roy Fellows** [*A*] and **Mr. John Alan Redfern** [*A*].

Mr. Robert U. Robinson [*A*], who has been associated with **Mr. E. Daydon Griffiths** [*F*] for several years, has been taken into partnership. The practice will continue under the name of **Daydon Griffiths** at 28 Gloucester Place, Portman Square, London, W.1, and at Maidenhead.

Mr. John A. Snellgrove [*A*] has commenced practice under his own name at Bell Lane, Broxbourne, Herts. (Hoddesdon 4772).

The firms of **G. Gordon Stanham and Adamson** and **Gray and Adamson** have now amalgamated under the style of **G. Gordon Stanham, Adamson, Gray and Partners,** and will practise from 9–10 Fenchurch Street, London, E.C.3 (Mansion House 5274 and 1010). The partners are **Mr. H. G. Stanham,** T.D. [*F*], **Mr. A. F. G. Stanham** [*F*], **Mr. J. E. Adamson,** D.S.O., O.B.E. [*L*], **Mr. Andrew L. Gray** [*F*], **Mr. D. M. B. White** [*A*] and **Mr. C. S. Campbell** [*A*].

Mr. Fraser Watts [*A*] has formed a partnership with **Mr. Raymond Moriyama** under the style of **Moriyama and Watts** at 106 Yorkville Avenue, Toronto 5, Canada, where catalogues and samples will be welcome.

Mr. F. R. S. Yorke [*F*], **Mr. E. Rosenberg** [*F*], and **Mr. C. S. Mardall** [*F*] have taken **Mr. Thomas Randall Evans** [*A*] and **Mr. David Allford** [*A*] into partnership. The firm will continue to practise under the name of **Yorke, Rosenberg and Mardall,** at 2 Hyde Park Place, London, W.2.

CHANGES OF ADDRESS

Messrs. Kenneth Anns and Partners (**Kenneth Anns** [*F*] and **D. T. Hunneyball** [*A*]) of 1 Lincoln's Inn Fields, London, W.C.2, have opened a branch office at 33 Windsor Street, Chertsey, Surrey (Chertsey 2968).

Mrs. Josephine A. Binney [*A*] has changed her address to Bethany, Acreman Street, Sherborne, Dorset.

The new office address of **Mr. J. H. C. Brown** [*A*] (incorporating **Cummings and Brown**) is 35 Manchester New Road, Middleton, Manchester. The telephone number remains Middleton 2200.

Messrs. Chart, Son and Hagyard [*L*] have transferred their Surrey office from Croydon to Dolly Farm, Brockham, Betchworth, Surrey (Betchworth 2188).

Mr. Geoffrey Ind Clothier [*A*] of The Gamekeepers Cottage, Woodcock Hill, Rickmansworth, has changed his telephone number to Rickmansworth 5141.

Mr. G. H. Field [*A*] has changed his address to 138 Gilbert Road, Cambridge.

Mr. R. C. N. Golding [*L*] has changed his address to 4 Tenby Mansions, Brent Street, Hendon, London, N.W.4 (Sunnyhill 0202).

Mr. J. Granger-Taylor [*A*] has closed his practice at 18 St. Mary Abbots Terrace, London, W.14. He is maintaining his library of trade literature at 28 Cleveland Road, Barnes, London, S.W.13, where he will be pleased to receive catalogues, etc.

Mr. Ronald Leach [*A*] has changed his office address at Westgate-on-Sea to 16 Harold Avenue, Westgate-on-Sea, Kent (Thanet 31048).

Mr. James F. McLean [*A*] has changed his address to 12 Renfrew Road, Half Way Tree P.O., Kingston 10, Jamaica, B.W.I.

Mrs. A. Muriel Nutting [*A*] has changed her address to Lapwings, Sparepenny Lane, Farningham, Kent (Farningham 3017).

Mr. S. Rowland Pierce [*F*] has changed his address to 21 Bedford Square, London, W.C.1 (Museum 8985).

Mr. John M. Ramsay [*A*] has opened a branch office at 15 South Street, Farnham (Farnham 4211), where he will be pleased to receive trade catalogues, etc.

Mr. T. Idwal Roberts [*A*] has changed his address to 'Estoril', Midhurst Drive, Goringby-Sea, Worthing, Sussex (Goring 42338).

Mr. G. L. Thompson [*F*] of 22 Park Street, Selby, has opened a second office at The Yorkshire Penny Bank Chambers, 46A Coney Street, York, where he will be pleased to receive trade catalogues, etc.

Mr. William Townell [*A*] has changed his address to 2 Campus Martins, Heddon on the Wall, Northumberland.

Mr. Charles F. Ward, M.B.E. [*F*] has changed his address to 66 Fields Park Road, Newport, Monmouthshire. Manufacturers are requested *not* to send him trade literature.

Mr. Ivor Warner [*A*] is now practising from 57 Shelton Street, Covent Garden, London, W.C.2.

Mr. Clifford Wearden [*A*] has changed his address to 35 Homer Street, London, W.1 (Ambassador 4641).

Mr. Iorwerth M. Williams [*A*] has changed his address to Claremont House, 67 Montpellier Terrace, Cheltenham, Glos.

Mr. S. G. Wilson [*L*] is shortly leaving 13 West Street, Harrow, for the West Country. He requests that his name be removed from mailing-lists for trade circulars, appeals, and American literature, as these communications will not be forwarded.

PRACTICES AND PARTNERSHIPS WANTED AND AVAILABLE

Associate (36), with nine years' varied experience in private practice, requires partnership, or responsible post leading shortly to partnership, in progressive office. South of England preferred. Capital available. Box 77, c/o Secretary, R.I.B.A.

Associate (35), wishes to purchase a practice or partnership with principal contemplating gradual retirement. Preferably southern counties or coastal area, but prepared to consider any opportunity in this country or abroad. Advertiser is keen, energetic, and has excellent all-round experience both in this country and overseas. Box 87, c/o Secretary, R.I.B.A.

Member, with small well-established practice and first-class office accommodation in Guildford area, desires an energetic experienced partner with good personality, able to bring in further business with a view to expansion. Box 88, c/o Secretary, R.I.B.A.

Senior Associate, with small but old-established east-midland town practice, wishes to associate or amalgamate with old or new practice on a mutually agreed basis. Box 91, c/o Secretary, R.I.B.A.

Fellow (46), five years' planning and housing experience in New Town and five years overseas, seeks partnership where overseas experience and contacts useful. Some capital available. Box 92, c/o Secretary, R.I.B.A.

Fellow wishes to acquire established general practice, north, west, or east Riding of Yorkshire. Some capital available. Box 95, c/o Secretary, R.I.B.A.

For sale in Midland coastal town, a flourishing practice with all equipment, freehold office and flat. Box 96, c/o Secretary, R.I.B.A.

Associate Dipl. Arch. (36), with seven years' varied experience, seeks partnership, or position leading thereto, in progressive office in London or south of England. Some capital available. Box 97, c/o Secretary, R.I.B.A.

FOR SALE

For Sale. Almost new D.E. board and T-square box. Box 90, c/o Secretary, R.I.B.A.

For sale. Double elephant photo copier (Halden). £50 o.n.o. Box 94, c/o Secretary, R.I.B.A.

For Sale. Member going abroad has for immediate disposal one double elephant adjustable drafting machine, Admel type, including floor stand, lighting, drawing board and scales. Excellent condition, almost new. £45. Box 98, c/o Secretary, R.I.B.A.

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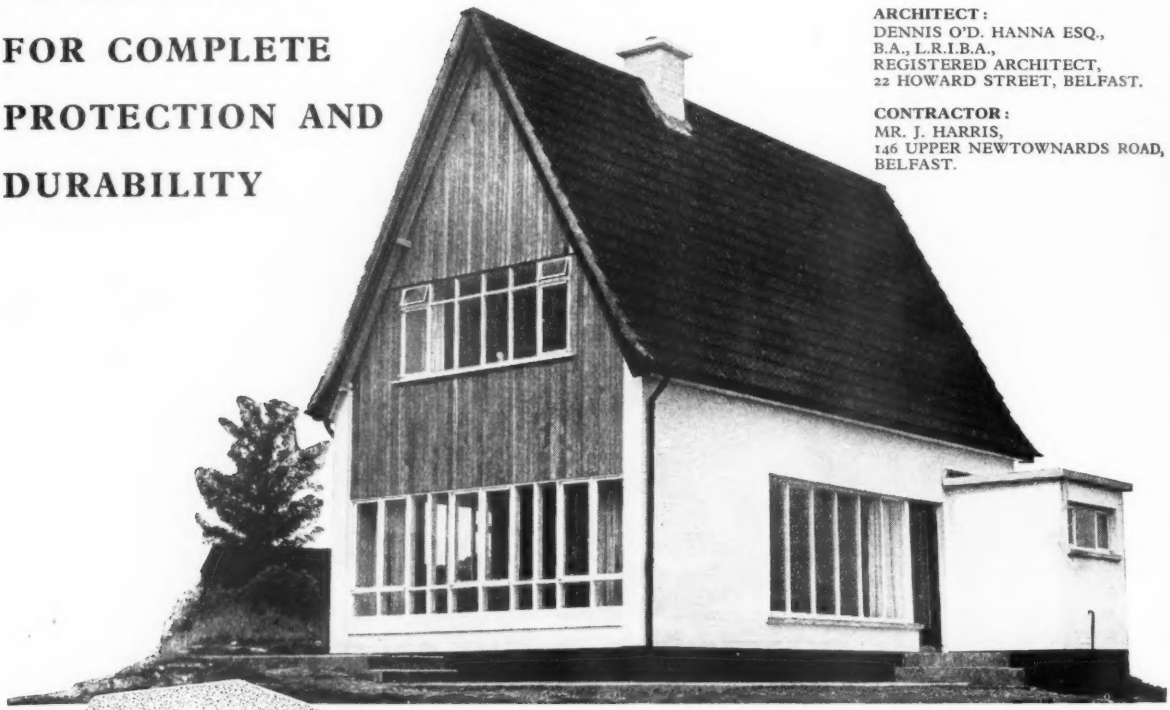

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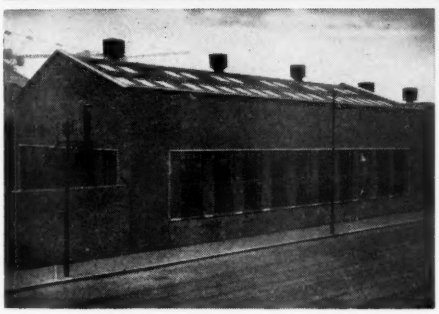

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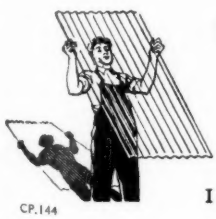

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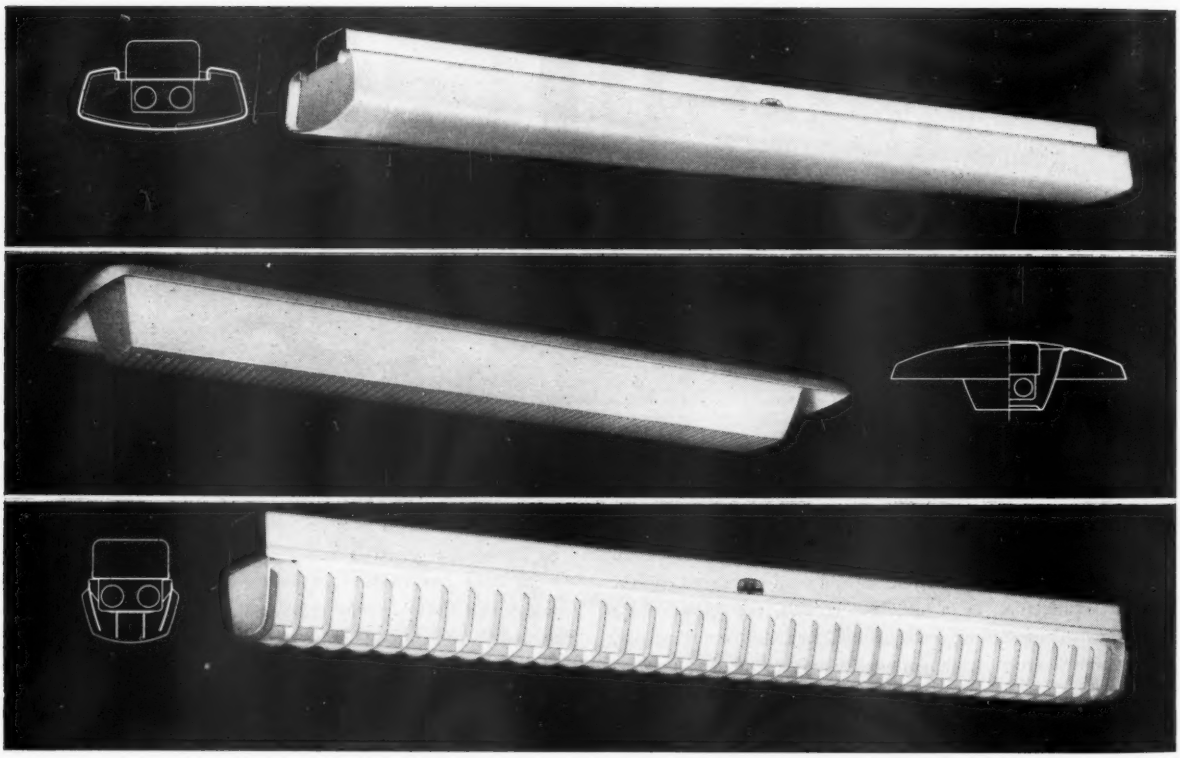

1 *SERIES 1B. Opal acrylic diffuser of soft diamond texture, with interchangeable coloured end plates.*

2 *SERIES 1C. One-piece acrylic, moulded diffuser and canopy, underside ribbed for contrast.*

3 *SERIES 1E. Attractive "Twinluve" diffuser, with pearl finish polystyrene sections.*

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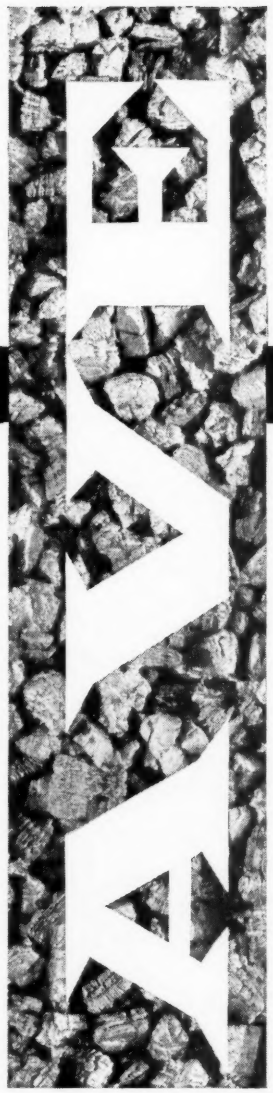

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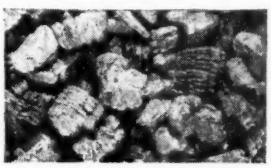

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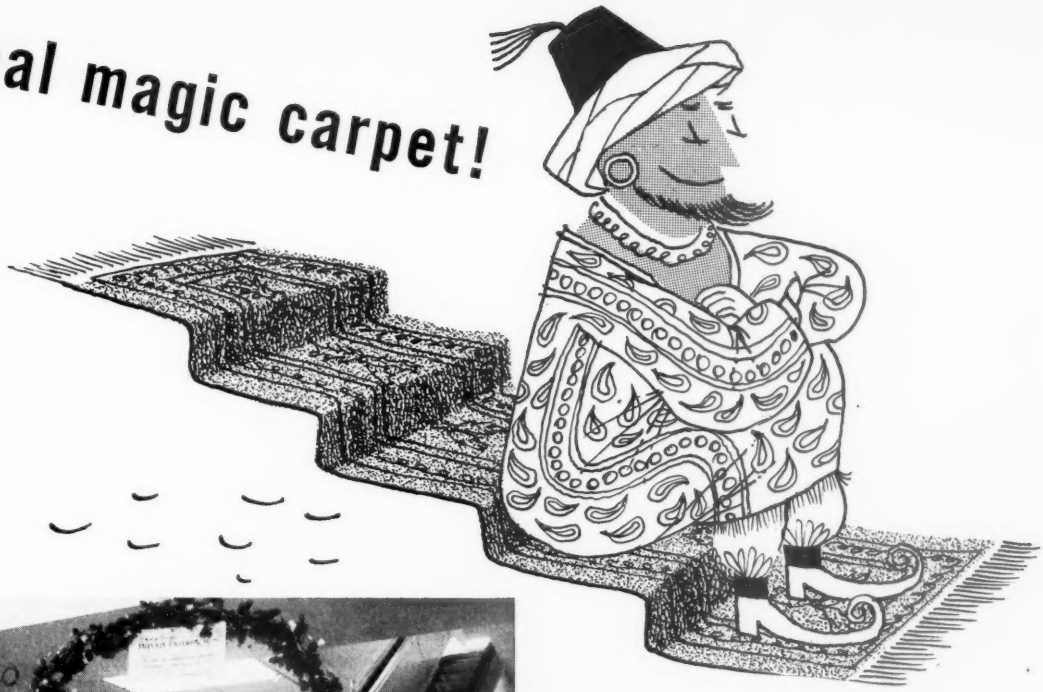

Only a child's description but how well it fits the modern escalator which with its invisible mechanism can carry up to 8,000 persons per hour from one enchanting scene to another, quietly, safely and smoothly!

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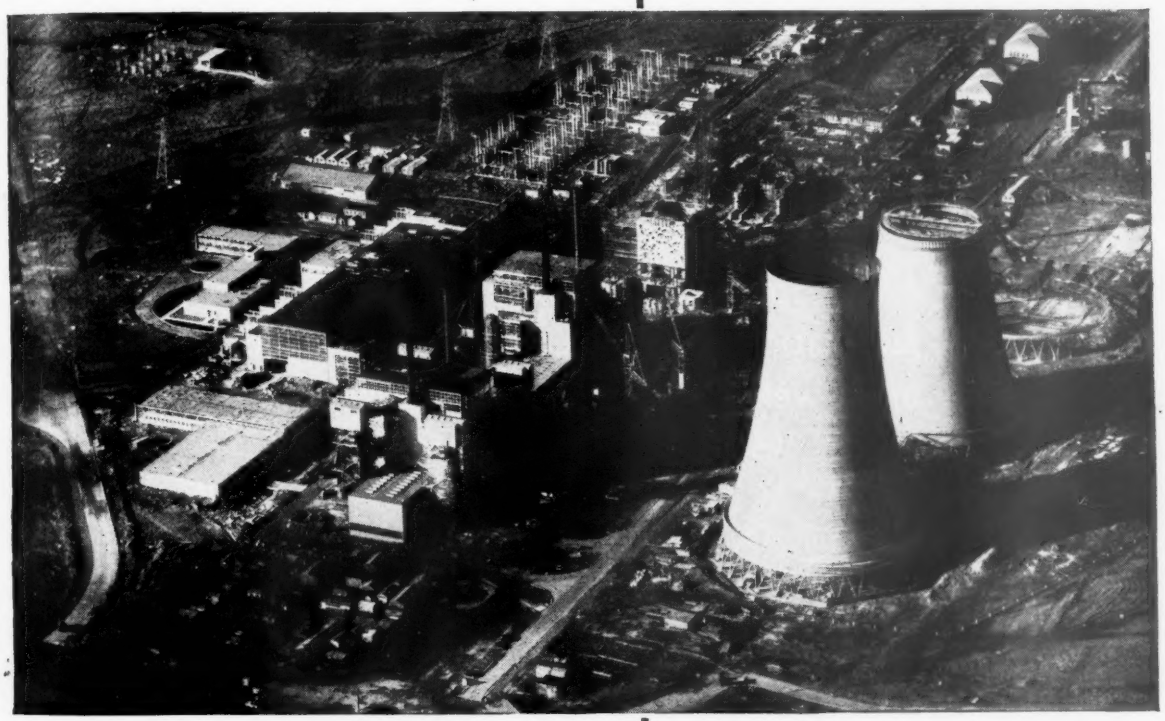

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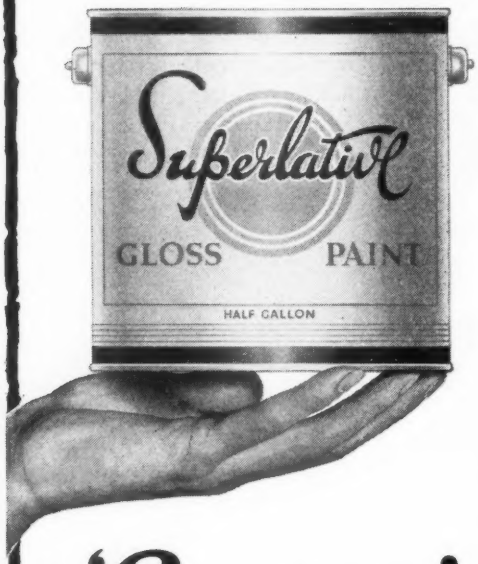

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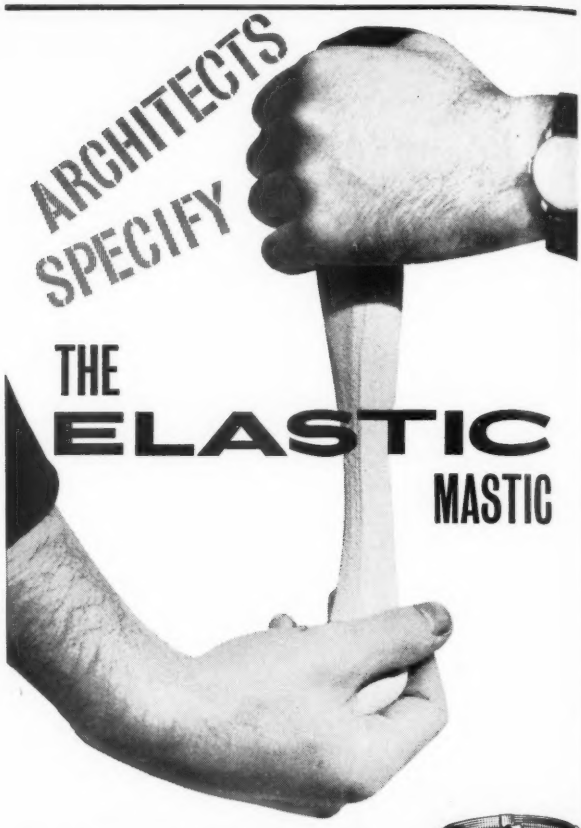

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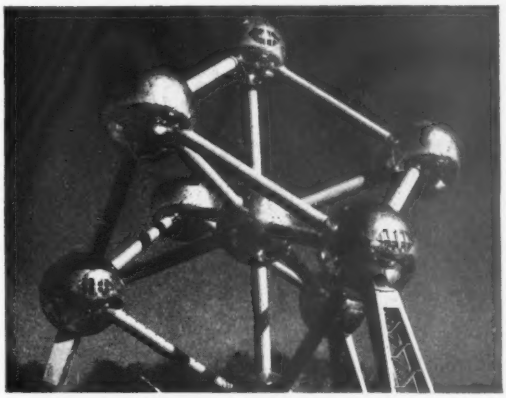

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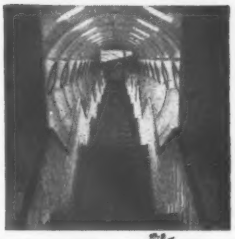

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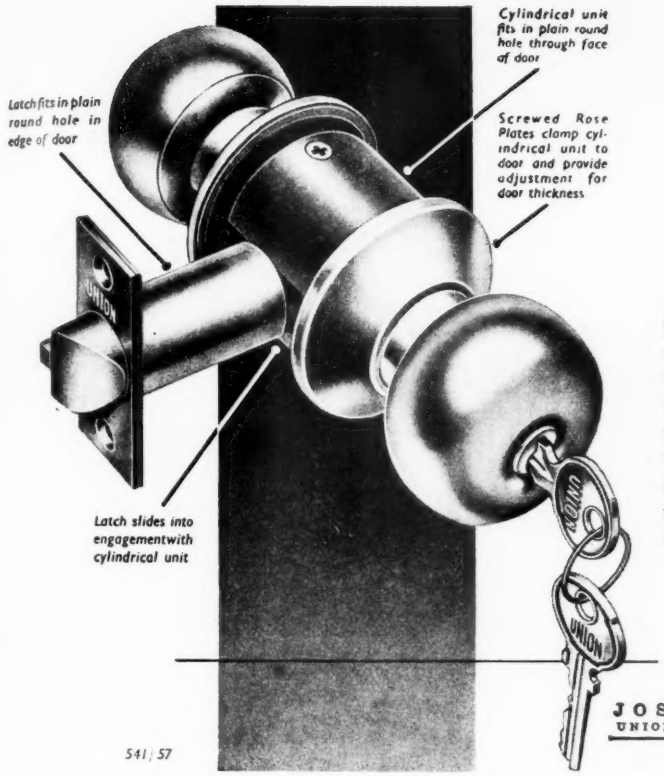

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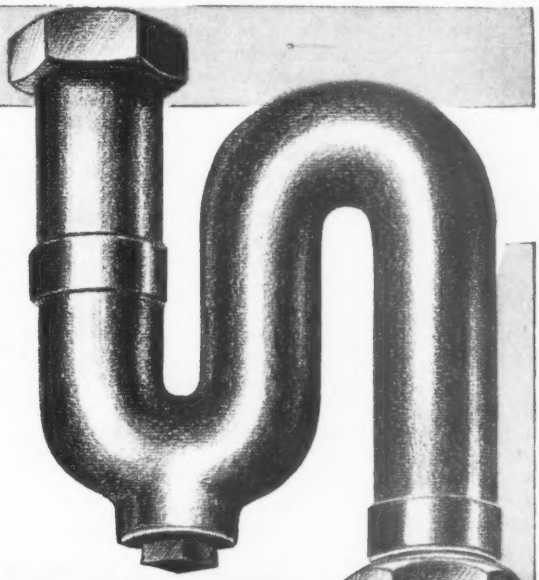

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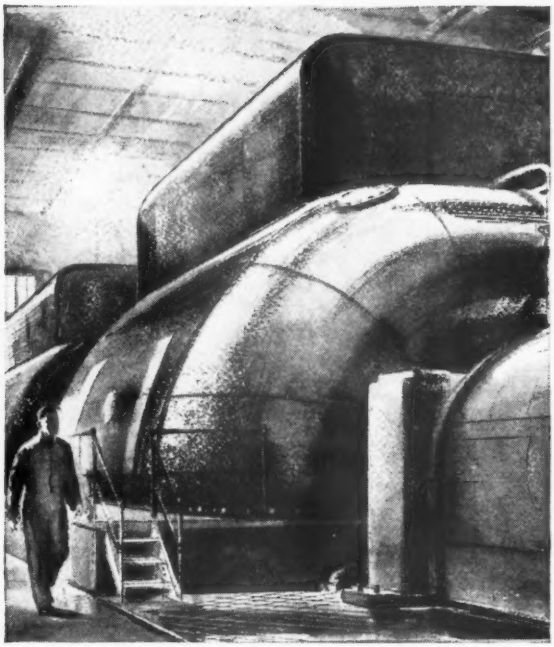

The world's largest Generators will help to fill the demand for still more power

The development of nuclear energy for generating electricity is still front-page news. Less publicised, though no less outstanding, are new developments in "conventional" generating plant. The turbo-alternator shown here is a 550,000 kilowatt unit – twice the capacity of the next largest on order for the Central Electricity Generating Board. It has been designed for the projected new power station at Thorpe Marsh. For Blythe 'B', another new station, 275,000 kilowatt in-line units are on order. They will be powered by steam at 2,350 lb. per sq. in. and 1,050°F, with reheat to 1,000°F.

Nuclear power will play an important part in meeting the ever-increasing demand for electricity. Work is now in progress on the first three nuclear power stations, at Bradwell, Berkeley and Hinkley Point. By 1966/7 some 5 to 6 million kilowatts of nuclear-generated electric power will be available.

Though these projects will not be completed for some time, the Central Electricity Generating Board plays an important part in today's fight against inflation. Power stations are being built at a cost no greater than in 1948 – £50 per kilowatt installed. And, although the output of the industry has doubled since 1948, the increase in manpower is only about one-third.

By providing today for the power we shall need in years to come, the Central Electricity Generating Board is building a secure foundation for our future prosperity.

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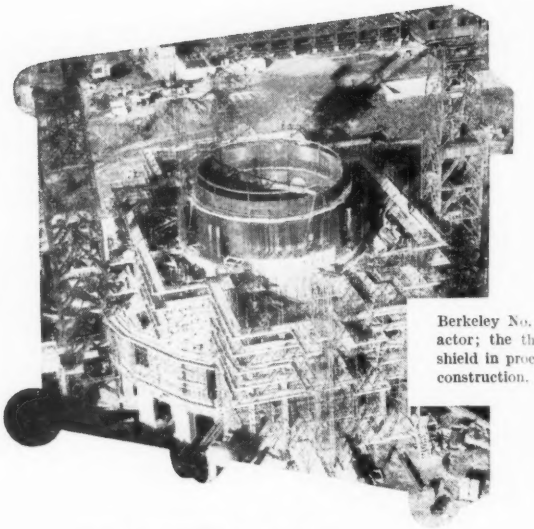

Berkeley No. 1 reactor; the thermal shield in process of construction.

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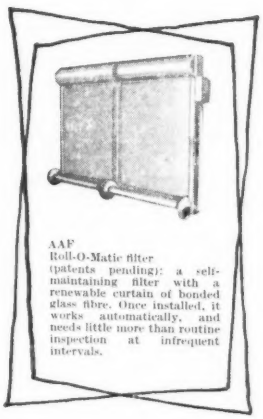

AAF Roll-O-Matic filter (patents pending): a self-maintaining filter with a renewable curtain of bonded glass fibre. Once installed, it works automatically, and needs little more than routine inspection at infrequent intervals.

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says Major J. H. HACKETT

Director of Hackett (Builders) Limited, Norwich

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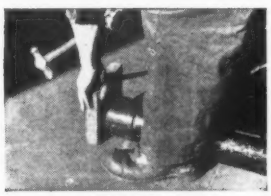

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